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Collective Review

BENIGN NEOPLASMS OF THE SMALL INTESTINE

A Critical Comprehensive Review With Reports of 20 New Cases

LOUIS RIVER, M.D., F.A.C.S., JOSEPH SILVERSTEIN, M.D., F.A.C.S., and JOHN W. TOPE, M.D., Chicago, Illinois

BENIGN NEOPLASMS of the small intestine are of uncommon occurrence, are characterized by mild and nonspecific symptoms, and usually come to clinical notice because of complicating acute intestinal obstruction. Knowledge of their incidence, anatomic nature, and clinical behavior has accumulated slowly by comparative study of individual case reports since the first collective review was published by Heurteaux in 1899. Subsequently, fourteen comprehensive reviews of all types of these uncommon tumors have appeared in the world literature. Other authors have collected and studied reports of tumors of one microscopic type only or of tumors occurring in one section of the bowel, while still others have published reports of tumors of various types collected from the clinical and necropsy records of one or of a group of hospitals.

Our interest in these tumors was first aroused by contact with 3 cases at the Cook County Hospital, and subsequently was stimulated by continuing clinical experiences with them. Limited investigations disclosed great discrepancies between the numbers and types of tumors included in various collective reviews. Later, it became obvious that reviewers had taken into account only a small proportion of all the published reports of original cases, the majority of which had apparently been overlooked in the voluminous literature on intussusception. These observations led to an exhaustive search for original reports containing data sufficient for classification and comparative analysis. This review, the result of that search, is presented in the belief that tabulation and analysis of so large a body of data with careful classification of the bibliography will lessen the possibility of disagreement, duplication, and repetition in future studies of this field.

Despite the extent of this study there have been limitations to its inclusiveness. First, even though previous reviewers may have listed them, we have not included cases in which the data given are inadequate to establish the type of tumor and the site of origin. Further, we have

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John W. Tope, Senior Surgical Resident and Jerome D. Solomon Foundation Fellow in Surgery, Cook County Hospital, Chicago, 1952–1953.

TABLE I.—TYPES AND NUMBERS OF TUMORS STUDIED; 20 CASES PREVIOUSLY UNREPORTED FROM COOK COUNTY HOSPITAL ARE INCLUDED.

Adenomas	227
Polyps	170
Polyposis (adenomatosis) with melanin pigmentation (Peutz-Jeghers syndrome)	59
Lipomas	219
Myomas	179
Fibromas	163
Angiomas and hemangiomas	127
Neurogenic tumors	90
Fibromyomas	81
Fibromyxomas and myxofibromas	26
Lymphangiomas	18
Fibroadenomas	15
Myofibromas	12
Myxomas	8
Reticulofibromatosis	1
Teratoma	1
Hemangiopericytoma	1
Osteoma	1
Osteofibroma	1
Total	1,399

not included tumors and ectopic inclusions of Meckel's diverticulum, enterogenous cysts, aberrant pancreatic or other tissues, carcinoids, endometrial inclusions, plasmocytomas, hamartomas, granulomas, hematomas, and inflammatory polyps, as they can hardly be considered true benign neoplasms of the small intestine. Next, because of difficulty in avoiding duplications, we have not included Mayo Clinic cases in the tables but have recorded them in a separate section (Part II). In addition, a relatively small number of references apparently relating to the subject could not be studied because the publications were incompletely identified or inaccessible. Finally, a review of cases published only in reports of discussions was not attempted nor were case reports published later than December, 1954 included.

Table I shows the types and numerical frequencies of the tumors studied, exclusive of those in the Mayo Clinic series.

INCIDENCE

The small numbers of benign tumors encountered in thousands of autopsies and among tens of thousands of surgical specimens attest the infrequency of their occurrence. Incidences reported from various large hospitals are shown in Table II.

Benign tumors of the small intestine are found at least fifteen times as often among 1,000 autopsies as among a like number of surgical specimens, a disproportion suggesting that a majority of them cause no symptoms leading to operation. In reporting 44 benign small bowel tumors (including 15 carcinoids) Dundon at the University Hospitals of Cleveland noted that only 2 of them caused symptoms (intussusceptions), that 3 were incidental findings at operation, and 39 were found at autopsy. However, among the 1,399 reports which met the criteria for inclusion in our tabulations, 1,014 (72.4%) of the tumors were found at operation (including exploratory laparotomies which revealed extensive lesions considered unsuitable for resection), 52 (3.9%) were missed at operation but found later at autopsy, and 269 (19.2 per cent) were autopsy findings. In 63 instances (4.5%) the circumstances of discovery were not stated. One case (Glass, 1940) concerned a patient with generalized gastrointestinal polyposis which was diagnosed by roentgenography, but because of the extent of the disease only blood transfusions were given and operation was not performed. The patient was still living at the time the case was reported. The 20 Cook County Hospital cases, included in these figures and here reported for the first time, were discovered at operation, except for 2 instances in which the tumor (one diagnosed during life and one suspected) was found at autopsy.

Raiford (1932) stated that 8.9 per cent of all tumors of the gastrointestinal tract were benign, and that 23.8 per cent of these were in the small intestine. The relative incidences of benign and malignant tumors of the small intestine can be estimated from reports such as follow. (Some cases in these articles were reported in sufficient detail for comparative analysis and are represented in our tables.) In 22,810 autopsies Buckstein found 65 tumors of the small bowel; 35 were benign. The clinical and pathologic records at the Boston City Hospital from 1933 through 1952 were reviewed by Elias *et al.* (1954) and they found 57 benign tumors of the small bowel, 46 at autopsy and 11 at operation. Weibel, Joergenson, and Keasbey (1954) collected 165 small bowel tumors from four hospitals over a 16 year period and found that only 65 were benign. Hoffman and Grayzel reported 33 of 58 tumors to be benign, but in Dedick and Collins' study of 53 bleeding neoplasms of the jejunum and ileum, only 15 were benign. Equally discouraging was the fact that only 4 of the 16 cases reported by Jenkinson, Pfisterer, and Seitz, 7 of the 20 reported by Weinberger and Paltauf, and

TABLE II.—INCIDENCES OF BENIGN TUMORS OF THE SMALL INTESTINE AT VARIOUS LARGE HOSPITALS

Author	*Hospital*	*Number of Autopsies*	*Cases*	*Number of Surgical Specimens*	*Cases*
Willis (Mallory)	Boston City	4,165	11	25,000	1
Willis	Massachusetts General	3,327	8		
Merchant	Royal Victoria (Belfast)	7,340	18	50,775	6
Browne and McHardy	Charity Hospital and Touro Infirmary (New Orleans)	7,970	7		
Negri	Istituto di Anatomia Patologica di Parma	20,000	1		
Szary	Good Samaritan (Los Angeles)			82,003	12
Hansen	Hospital of University of Pennsylvania			51,261	4
Kirshbaum	Cook County (Chicago)	5,774	12		
River, Silverstein, and Tope	Cook County (Chicago) (1939–53)			117,533	18
Rosenfeld and Brinkman	Open Division of Kings County (Brooklyn)			(Surgical admissions) 65,638	3

7 of the 19 recorded by Eckel were found to be benign. Of the malignant lesions, carcinoma was less common than sarcoma. Shallow states that while carcinomas of the small intestine make up only 0.5 per cent of the gastrointestinal cancers, the majority of intestinal sarcomas occur in the small bowel. Most authors conclude that both the incidence of all tumors and the relative incidence of malignant tumors increase from the duodenum to the ileum.

Among the 1,323 cases in which the sex was identified, 685 were in males and 638 in females. In each sex slightly more than 60 per cent of the tumors occurred in individuals between 30 and 60 years of age. Approximately one-seventh of all the tumors were found in individuals less than 20 years old, including 19 discovered in infants under one year of age. Tables similar to Table III are given later for specific types of tumors.

ETIOLOGY

The etiology is unknown. Absence of stasis, freedom from kinks, and alkalinity of the juices have been repeatedly mentioned as possible factors in the relatively infrequent occurrence of small bowel cancer. Conheim thought that rapid elongation of the small bowel late in fetal life might contribute to the possible freedom from fetal rests and from arrests of development. Susceptibility to tumor formation increases progressively toward the ileum (See Table IV). It is possible that factors responsible for low cancer incidence may also inhibit the formation of benign epithelial tumors, since adenomas, which are also the result of primary epithelial changes, occur with less than the expected percentile frequency among benign small bowel tumors.

The syndrome of multiple intestinal polyposis combined with melanin pigmentation of the lips, buccal mucosa, and digits has been shown by Jeghers (1949) to be inherited as a simple mendelian dominant. Peutz (1921), who first described the syndrome, noted the hereditary pattern of occurrence, and others, in writing of adenomas and polyps (particularly multiple ones), have mentioned a tendency toward familial occurrence. Multiple neurofibromatosis of the small intestines has been observed in the victims of von Recklinghausen's disease. Hashemian (1953) described the occurrence of multiple fibromas of the small bowel in the cases of a mother and her adult son and daughter, all 3 of whom had scattered areas of pigmentation on the body, but no other signs of von Recklinghausen's disease. In a discussion of hereditary hemorrhagic telangiectasis involving the small bowel, among other parts of the gastrointestinal tract, Gentry, Dockerty, and Clagett remarked that Rendu (1896) was the first to associate familial epistaxis with multiple telangiectasis of the gastrointestinal mucous membrane, and, further, that Goldstein's search of the literature up to 1931 revealed this unique disease among only 600 individuals of about 100 families.

PATHOLOGY

Table I shows that more than three-fourths of the benign tumors of the small bowel are ade-

TABLE III.—AGE AND SEX INCIDENCES OF ALL TYPES OF BENIGN NEOPLASMS OF SMALL BOWEL

Age	*Male*	*Female*	*Unstated*	*Total*
Under 1 year	12	5	2	19
1– 9 years	28	32	4	64
10–19 years	53	68	1	122
20–29 years	89	81	2	172
30–39 years	86	112	—	198
40–49 years	137	110	1	248
50–59 years	128	109	—	237
60–69 years	85	77	—	162
70–79 years	32	23	1	56
80–89 years	6	2	—	8
90 and over	1	—	—	1
Not given	28	19	65	112
Total	685	638	76	1,399

nomas, lipomas, polyps, myomas, fibromas, angiomas, and hemangiomas and that more than two-thirds of all are tumors of connective tissue origin. Regardless of the predominant tissue, and to some extent of size, these tumors are found as intraluminal, extraluminal, or intramural growths which are polypoid, globular, plaque-like, or annular in structure. A majority of them tend to grow into the bowel, perhaps, as Raiford suggested, because of the resistance of the bowel wall to growth in the opposite direction. However, some of them have been noted to occupy all three locations, particularly fibroid tumors and the "dumbbell-shaped" vascular tumors. Both intramural and extraluminal tumors are likely to affect the mucosa and the rest of the bowel wall both anatomically and physiologically unless they remain of small size. They are reported as varying in size from that of a grain of wheat to that of a fetal head, although some are described to be of such weight that they must greatly exceed these dimensions. One of the weightiest tumors on record was a fibroleiomyoma of 6.5 kilograms which came to notice because of compression obstruction of the terminal ileum (Moreaux, 1951). Although it would seem that intraluminal tumors should cause notable symptoms when they approach the caliber of the gut in diameter, such is not usually the case. As intussusceptions caused by peristaltic drag on such small tumors frequently reduce themselves spontaneously, rapidly, and repeatedly, and dilatation of the gut is sufficient to allow its contents to bypass the tumor, the symptoms are not interpreted as urgent. At operation in such cases dilatation and hypertrophy is noted both above and below the tumor, whereas these changes are seen only above a tumor which obstructs by encroachment or compression.

The gross and microscopic appearance of all types of benign tumors of the small bowel has been discussed at length in reviews and case reports; the descriptions show that these tumors differ little from those of comparable origin in other locations. More than 90 per cent of the case reports reviewed included histological descriptions, and in all cases the authors advanced reasons for the manner of classifying the tumors. We have accepted these classifications with the exception of some growths originally classified as polyps. The following paragraphs give our reasons for listing some of these intraluminal tumors otherwise than as polyps. Saint (1927) described the pathogenesis of intraluminal polypoid growths as follows: "The intestinal wall is made up of various types of tissue, viz., the mucous membrane, areolar tissue forming the submucous and the subperitoneal layers, the unstriped fibres of the musculature, vascular tissue, and the outermost endothelial peritoneal coat. From these various tissues tumours of different varieties may arise, and, enlarging, project into the lumen of the bowel to form polypi. Thus it is possible to find adenomata and papillomata arising from the mucous membrane; fibromata, lipomata, and myxomata from the areolar tissue (though only very rarely from that of the subperitoneal layer); myomata from the musculature; and hemangiomata from the vessels. The peritoneal coat alone appears innocent of any attempt at tumour formation. Thus the term polypus covers a heterogeneous collection of tumours, and it is necessary in using it to be specific from the histologic standpoint." Most of the later case reports are of adenomatous polyps, and it is reasonable to believe that a majority of tumors described simply as polyps are in reality polypoid adenomas, consisting of a central fibrovascular core surrounded by acini usually better differentiated at the center of the growth than at its periphery. Polypoid growths thus described have been classified in this paper as adenomas located intraluminally. In like manner those stated to consist predominantly of any one other tissue have been grouped with similar tumors located intramurally or extraluminally. Polypoid projections into the lumen of the bowel which showed their inflammatory nature by the presence of round cell infiltration or of oxyuris vermicularis were not considered as neoplasms. Hence, the number of polyps listed here is less than in previous reviews concerned with polyps.

Peutz (1921) first described the occurrence of multiple polyposis of the small intestine combined with melanin pigmentation of the lips, oral mucosa, and digits in 7 members of three generations of one family. Hutchinson had observed this sort of pigmentation 25 years earlier in 2 sisters, one of whom died at age 20 following an operation for intussusception, but he did not mention polypi. Obversely, one wonders how often the pigmentation was overlooked in examinations of the numerous patients whose multiple simultaneous or serially occurring intussusceptions were reported as being due to multiple polypi (see Cope, 1922 and Wolff, 1952; also paragraphs on intussusception). Jeghers, McKusick, and Katz reviewed the literature in 1949 and presented a classical study of 10 cases personally observed. "This syndrome consists of two features: distinctive melanin spots of the buccal mucosa and lips—the face and digits may be involved to a variable extent, but the mouth pigmentation is the *sine qua non* of this portion of the syndrome; and polyposis (synonyms are adenomatosis and papillomatosis) of the small intestine. The stomach, colon and rectum may be involved, but the presence of polyps in the small intestine is the constant feature of this component of the syndrome . . . Sufficient genealogic data are reported to demonstrate the hereditary nature of the syndrome, which appears to be inherited as a simple Mendelian dominant. Sporadic cases also occur." Cases of this syndrome proved at operation or autopsy have been classified in a separate section (Table VIII). Two of these are in the Cook County Hospital series, previously unreported. Reports of 8 cases diagnosed as "probable" and "possible" exemplifications of the syndrome were studied but not included. (A further study of this syndrome is in preparation for publication by the authors.) The later reports have emphasized the value of knowledge of the syndrome in the diagnosis of intestinal bleeding, particularly in children. Peutz, Jeghers, and others recorded an appreciable incidence of malignancy in adenomatous polyps, especially in the ileum. A problem of major importance in the treatment of patients with multiple tumors and multiple nonsimultaneous obstructions is that of preservation of enough small intestine for adequate function. In one of Jeghers' cases a spruelike syndrome developed after small bowel resection, leading to inanition and contributing to the patient's death.

TABLE IV.—SITES OF BENIGN NEOPLASMS OF THE SMALL BOWEL

Ileum	606
Jejunum	272
Duodenum	198
Small intestine (exact site unspecified)	193
Entire small intestine	39
Jejunum and ileum	23
Ileocecal junction	17
Entire gastrointestinal tract	7
Duodenum and jejunum	6
Jejunoileum junction	5
Jejunum, ileum, large intestine, and stomach	5
Jejunum, ileum, and large bowel	5
Small intestine (site unspecified) and large bowel	5
Jejunum and stomach	3
Entire small intestine, stomach, large intestine	2
Entire small intestine and large intestine	2
Ileum and ileocecal valve	2
Duodenum, small intestine (site unspecified)	1
Duodenum, small bowel (site unspecified), and large bowel	1
Duodenum, stomach, and large bowel	1
Jejunum, ileum, and stomach	1
Jejunum, ileum, stomach, and duodenum	1
Jejunum and large bowel	1
Jejunum and small bowel (site unspecified)	1
Small intestine (site unspecified) and stomach	1
Ileum and large bowel	1
	1,399

Knowledge of the pathologic characteristics of separate groups of tumors is of slight importance compared to familiarity with the complications likely to be associated with the simple physical presence of any kind of tumor. Hence, further discussion of specific pathology is deferred to the section of this paper devoted to individual types of tumors in favor of immediate attention to the recorded effects of benign tumors on the anatomic and physiologic integrity of the bowel. These include the complications of intestinal obstruction, intestinal bleeding, and the lesser results of interference with peristalsis and of mucosal ulceration.

COMPLICATIONS

The complication most commonly associated with benign tumors of the small intestine is intestinal obstruction, and the most common form of obstruction is intussusception. Obstruction was described as present in 877 cases and absent in 359 cases; there was no statement whether or not it had been present in 163 reports, almost entirely those of autopsy findings. Study of the literature on intussusception shows that benign small bowel tumors are the most common cause of this accident in adults (suggesting the reason for the ignorance of previous reviewers of a majority of these reports). Intussusception was the

type of obstruction in 627 cases. Intussusception may be progressive and irreducible, or it may reduce spontaneously. Thereafter, telescoping and extension may recur repeatedly at shorter or longer intervals. Such recurrent disturbance of normal peristalsis leads to dilatation and hypertrophy of the bowel distal to the tumor, the intussuscipiens, and to a lesser degree of that portion proximal to it, the intussusceptum. If chronic incomplete obstruction is due to encroachment or compression by tumor, these changes are noted only in the proximal bowel. Intestinal obstruction due to compression and encroachment was present in 10 cases, encroachment alone in 101, and compression alone in 78. The pressure exerted upon intraluminal tumors by vigorous peristaltic contractions can cause elongations of pedicles with eventual necrosis of the latter and passage of the growths per anum. Pellizari (1875) described such passage of a 500 gram myoma supposed to have originated in the terminal ileum. (Reports such as this have not been used in this review.) Moderate or severe hemorrhage may be concomitant with pressure necrosis of either sessile or pedunculated tumors. Extraluminal tumors may impinge upon or compress the wall of the intestine sufficiently to cause gradual or sudden occlusion. Such tumors, particularly if intraperitoneal adhesions exist, may upon occasion precipitate acute volvulus, and intussusception and volvulus may occur concomitantly. Volvulus alone was present in 23 cases and there were concomitant intussusception and volvulus in 15 instances. Tumors of any type may undergo calcareous or cystic degeneration, necrosis, and hemorrhage. Abscesses resulting from these processes in extraluminal tumors may rupture into the peritoneal cavity or give rise to massive intraperitoneal hemorrhages. Exsanguinating intraluminal bleeding has occurred from relatively small hemangiomas. (Segal and Scott-Watson reported a 3 mm. tumor with a 2 mm. ulceration.)

Multiple tumors have been responsible for double, triple, and even quadruple simultaneous intussusceptions. Less commonly this complication has occurred at widely separated dates. Many instances have occurred in patients with adenomas, polyps, and melanin pigmentation—intestinal polyposis. Cope (1922) reported on a case in which four operations for intussusception had been done. Twenty-three years later multiple polypi of the small and large intestines were found at a fifth operation for intussusception. Wolff (1952), reporting this last operation, described the melanin pigmentation not mentioned by Cope. Jeghers *et al.* had several patients who had been subjected to multiple operations because of polyposis. Willis reported the case of a 7 year old female with ileal adenoma and intussusception. Eighteen years later she was operated upon by Williams who reduced a jejunojejunal intussusception caused by a large adenoma. Hillemand *et al.* (1952) recorded a case of intussusception caused by an adenoma; 18 months later a second operation was performed for volvulus caused by multiple adenomas; later a third operation was done for two intussusceptions caused by polyps. Piacentini's patient underwent 5 operations in 15 years for recurring intussusception caused by adenomas of the small bowel. (The cases of multiple operations for tumors have been indicated in the bibliography by ††.)

Almost as many benign tumors arise in the ileum as in the rest of the small intestine combined. This fact and the increasing concentration of contents lower down the bowel are probable reasons for the greater relative frequency of intussusception in that section. However, intussusception has been observed in the duodenum. Dubourg *et al.* reported the case of a duodenal adenoma which caused roentgenologically varying appearances at intervals of several days. The first time the image suggested a duodenal ulcer perforating into the biliary passages; at the second examination it appeared as if a gastric tumor had invaginated into the duodenum with an invagination mass in the terminal portion of the duodenum and the proximal jejunal loop; the third examination showed a jejunal invagination. These two complications of invagination at the proximal jejunum were due to reflexes because at operation there was no tumor nor apex of invagination. It seems that in the course of the second roentgenological examination there had been a retrograde invagination of the bulbar adenoma into the stomach and a second subjacent invagination, only found again at the third examination. (References to 12 duodenal intussusceptions in the bibliography are indicated by †.) For the greater part, however, duodenal tumors are small and, if intraluminal, are more likely both to announce their presence by bleeding rather than by obstructive effects, and to mimic duodenal ulcer because of ulceration, pain, and the vomiting of bright red blood. There

TABLE V.—INTESTINAL BLEEDING

Type of Tumor	Total No. Tumors	No. Bleeding	Melena, etc. — No. Cases	Melena, etc. — With Intuss.	Severe Hemorrhage — No. Cases	Severe Hemorrhage — With Intuss.	Multiple Hospital Admissions	Multiple Operations	Deaths
Adenomas	227	70	49	33	21	9	3	6	—
Polyps	170	50	37	27	13	6	—	2	2
Polyposis (Peutz-Jeghers syndrome)	59	28	28	15	—	—	—	—	—
Lipomas	219	32	25	15	7	2	1	—	1
Myomas	179	87	46	8	41	1	7	5	7
Fibromas	163	30	27	11	3	1	3	2	6
Angiomas	127	55	23	6	32	2	6	3	3
Neurogenic	90	32	11	—	21	1	1	3	1
Fibromyomas	81	29	16	4	13	2	1	—	2
Fibromyxomas	26	2	2	2	—	—	—	—	—
Lymphangiomas	18	2	—	—	2	—	—	—	—
Fibroadenomas	15	6	4	2	2	—	—	—	1
Myofibromas	12	1	—	—	1	—	—	—	—
Myxomas	8	2	2	1	—	—	—	—	—
Reticulofibromatosis	1	—	—	—	—	—	—	—	—
Teratoma	1	—	—	—	—	—	—	—	—
Hemangiopericytoma	1	—	—	—	—	—	—	—	—
Osteoma	1	—	—	—	—	—	—	—	—
Osteofibroma	1	—	—	—	—	—	—	—	—
Totals	1,399	426	270	124	156	24	22	21	23

have been few reports of tumors in more distal parts of the bowel closely simulating ulcer or gallbladder disease, although an occasional high jejunal growth has done so. Intramural and extraluminal duodenal tumors seem more often to have remained asymptomatic than have similar tumors lower in the bowel, but some of larger size and in the fixed second portion have caused obstruction of the common bile duct.

Intestinal bleeding is the next most common complication. It was reported as a symptom in 426 (30.3%) of the cases reviewed here (Table V). The bleeding was described as occult blood, tarry stools, melena, or return of blood with enemas or on examining fingers in 270 cases, and in half of these instances intussusception was also present. In the absence of other dominant symptoms, the observation of slight bleeding led about as often to incorrect assumptions and inappropriate treatment as it did to persistent search for the source of the bleeding. Anemias of varying severity were reported from continued slight bleeding or from intermittent spells of melena before operations were performed, at which the tumors were located.

Long continued anemia necessitated multiple hospital admissions after which the diagnosis of the source of the bleeding was not made even with repeated x-ray examinations. Such patients were most frequently treated with transfusions and discharged with an incorrect diagnosis. Goldfarb (1954) reported an instance of a 10 year long anemia because of bleeding from a polypoid cavernous hemangioma of the ileum. The correct diagnosis was not made until a filling defect of the ileum was demonstrated by a roentgen ray study of the small bowel at the sixth hospitalization. No gross rectal hemorrhage had ever been noted.

Levrat *et al.* (1954) reported the case of a patient with periods of severe anemia for 32 years before operation was performed for an intraluminal angioma of the jejunum. No other angiomas were found in the intestinal tract. Such bleeding was most commonly found to originate as oozing from superficial mucosal ulcerations on intraluminal tumors, but it was also noted to arise from points on the wider surfaces of mucosa stretched over intramural or extraluminal growths.

Bleeding described as severe, violent, profuse, or exsanguinating occurred in 156 cases, in only 24 of which it preceded or was concurrent with intussusception. There were 23 deaths (14.1%). The difficulties of diagnosis are suggested by the records of 43 patients who underwent either repeated admissions to hospitals (22) or multiple operations (21) before discovery of the tumors. For these and for an additional group of patients who were operated upon at the first hospitalization, the periods during which severe hemorrhages recurred ranged from a few months up to 17 years (Jones—fibromyoma) and 36 years (Rosing-Bull—hemangiomatosis). One of the Cook County Hospital patients died from exsanguination due to an ulcerated telangiectasis 9 years

after the first laparotomy undertaken because of massive hemorrhage from the bowel. Four fruitless operations were performed before the diagnosis of telangiectasis was made by discovery of lesions on the lips and in the mouth. The site of bleeding was not found at any of these, nor at a last exploration made after the diagnosis of telangiectasia was known. The patient received more than 90 transfusions during thirteen hospital admissions.

Some profuse hemorrhages occurred from intraluminal tumors, particularly from vascular ones, but a majority were due to ulceration of mucosa over and into large veins on the surfaces of fibrous intramural or extraluminal growths. In Davidson's case (1954) of an extraluminal neurilemmoma of the jejunum, severe hemorrhage occurred from rupture of a vein draining the tumor and not from the tumor itself. Mercer described fatal bleeding into the bowel from an opening into an artery 4 millimeters in diameter in the pedicle of a myoma weighing 455 grams. Figures given in Table V indicate that half of the severe hemorrhages and more than three-quarters of the deaths from hemorrhage were associated with the presence of myomas (including leiomyomas), fibromas, fibromyomas, and fibroadenomas, groups comprising less than 40 per cent of all benign tumors. In a discussion of bleeding from fibromyomas Key-Aberg stated that the liability to severe hemorrhage was related to the close proximity between the mucosa and tumor surface upon which large vessels course, even though, as with extraluminal tumors, the area of contact was small. Fixation to adjacent structures may cause bowel mucosa to be stretched rather tightly over the tumor. Boidin and de Gennes recorded a death from hemorrhage following ulceration into a large vein on the surface of a 560 gram fibromyoma. It seemed as though the fixity imparted by the solid tumor had prevented the walls of the vein from collapsing. Although the tumor in Key-Aberg's case weighed 1,280 grams, the bleeding from it was slight in degree. Avoni described profuse bleeding with spontaneous arrest a month before a 1,500 gram extraluminal myoma was excised. Not all great and sudden blood losses were from large tumors, however, since fatal hemorrhage was described as the result of ulceration into an almond-sized intramural neurinoma (Lemonnier and Peycelon). (Reports of cases in which severe hemorrhage occurred have been marked with one asterisk, and those in which death from hemorrhage ensued, with two asterisks.)

Central necrosis of rapidly growing tumors is not uncommon, but we found only one report of both intraintestinal and intraperitoneal bleeding from necrosis in a neurofibroma (Suermondt). Zappa reported a case of large intraperitoneal hemorrhage from a neurofibroma, and König an instance of similar sort in connection with an extraluminal neurinoma. In each case the symptoms were those of peritonitis and no connection with the intestinal lumen was noted. Intra-abdominal hemorrhage resulted occasionally from necrosis following torsion of a pedicle.

Peritonitis occurred as a rare complication by fistula formation through intramural or extraluminal tumors (Cadiani, leiomyoma; Klages, myoma; Lamare and Larget, myoma; Botstiber, myoma; and Alfeef, leiomyoma). Alfeef's case is of especial interest, since the fatal peritonitis followed the migration of ascaris through the tumor and peritoneal surface after ulceration had progressed part way from the intestinal side. Warshauer and Nelson reported a case of neurofibroma of the jejunum with necrosis and perforation in a patient with generalized cutaneous neurofibromatosis. Three cases of perforation in familial fibromatosis of the small bowel were reported by Hashemian. The presence of or incarceration of tumors in hernial sacs has been recorded by Schenck, Kudirka (fibromas), Hopffgarten (lymphangioma), and Klages (myoma). Sladky observed a patient without a clinical history of bleeding who died of diffuse hemorrhagic pancreatitis due to perforation of an intramural leiomyoma of the duodenum. Rosenfeld and Brinkman recorded a case of leiomyoma which produced incarceration of the ileum (presumably in a hernial sac) with gangrene, perforation, and hemorrhage into the tumor.

Various authors have discussed the possibility of malignant changes in benign tumors, especially with regard to multiple polyposis or adenomatosis. Among the cases of polyposis with melanin pigmentation studied there were 10 in which carcinomatous changes were observed in the polyps. It is possible that such changes would be listed more frequently if multiple sections were made of each polyp removed in cases of this syndrome. The question of malignant transformation has been raised as well with regard to some leiomyomatous, neurogenic, and vascular tumors when seeming malignant clini-

cal behavior has followed local treatment selected because of presumed benignity. It has been claimed that 1 in 6 subserosal leiomyomas undergoes cancerous degeneration (Cherry and Hill, 1951). It may be difficult to distinguish grossly between benign and malignant tumors, especially when the former are of the annular type. While it is not unusual for annular benign tumors to cause intussusception, the condition is less common as a complication of malignant annular growths of the small intestine, since the latter infiltrate the wall sufficiently to prevent the start of the telescoping.

SYMPTOMS

Many small tumors quite obviously remain asymptomatic and are discovered, if at all, only incidentally at autopsies. Symptoms are vague and mild if the tumors are small or, if larger, are not yet causing high degrees of obstruction. Patients and physicians often attribute these mild dyspepsias to digestive upsets. Grimes and Swartz (1953) reported the case of a female, aged 14, who, since the age of 2, had had irregular attacks of intestinal obstruction. During this period she had been seen by 24 physicians and had received almost as many diagnoses. Finally, a scout film led to the diagnosis of recurrent intussusception probably due to a tumor of the small bowel. Sensations of fullness after meals or persistent mild abdominal discomfort may be the sole symptoms. The nearly liquid content of the duodenum and jejunum permits obliteration of the lumen to become almost complete before much retardation of the intestinal stream occurs. Even when high degrees of obstruction have occurred the duodenum and upper jejunum can empty themselves so completely in one act of vomiting that observers long may overlook the existence of dilated loops of gut and of incomplete intestinal obstruction. Thus it has been repeatedly noted that the type and severity of symptoms depend to a considerable degree upon the site, size, and relationship of the tumor to the bowel lumen. Intraluminal tumors are liable to cause symptoms earlier than other types of tumors.

Among the symptoms leading to operation, pain is the most common. It is described as epigastric or periumbilical aching or cramping in character, usually intermittent and liable to be associated with eructations, nausea, or nausea and vomiting. For long periods the pain may be mild and momentary, with recurrences only after months or years. However, as the obstructive effect of the tumor becomes progressively greater, exacerbations become more frequent and remissions less so. In the meantime, patients may note increasing constipation, sometimes alternating with bouts of diarrhea. An occasional tarry stool may contain mucus, and at least a trace of occult blood is liable to be present in some stools, particularly if the tumor is intraluminal. Anorexia and resultant weight loss are not infrequently described, as well as a persistent slow increase in abdominal girth. The slow onset of symptoms and the long intervals often noted between attacks of obstruction or bleeding reflect the slow growth of many tumors, just as the hypertrophy and dilatation seen at operation bespeak the chronicity of repeated intussusceptions or volvulus preceding the final attack.

Tumors of the duodenum produce symptoms varying from those just described and which may be easily misinterpreted as being due to other diseases of the duodenum, stomach, or pancreaticobiliary tract. They may cause burning pain in the epigastrium, hematemesis, and melena. Jaundice has resulted from compression of the common bile duct.

Extraluminal tumors of the jejunum and ileum have attained enormous size before causing symptoms. On the other hand, and particularly in the case of neurogenic tumors, central necrosis has occurred early in the course of their growth with resultant excavation, infection, and obstruction, and rupture has caused either peritonitis or intraperitoneal hemorrhage. These tumors have been discovered occasionally as nontender abdominal masses. Among the one-quarter of recorded cases in which an abdominal mass was described as palpable, the majority were those caused by intussusception, although abdominal distention apparently has prevented palpation of an intussusception in some instances. On the other hand, many probably have been felt rather late in the course of obstruction with vascular damage only because the intussuscipiens has protected the peritoneum from insult. In occasional instances intussusceptions and extraluminal tumors have been felt on rectal examination.

Premonitory symptoms may be absent or unnoticed, and the first attack may begin with all the symptoms of acute mechanical obstruction due to intussusception or volvulus. As has been

suggested in the foregoing paragraphs, however, patients in such acute attacks often may give histories of previous dyspepsias or colics. The obstipation, distention, and inability to pass gas during the acute obstructive episode are not relieved by enemas. It is helpful to remember that the higher the obstruction the more frequent are nausea and vomiting, and the less remarkable is distention. The occurrence of strangulation obstructions is accompanied by the usual local signs in addition to those of simple obstruction.

DIAGNOSIS

The most important single factor in the diagnosis of tumors of the small bowel is consideration of the possibility of their presence, which must be suspected whenever investigations of the stomach, duodenum, gallbladder, and colon fail to reveal the cause of either mild persistent dyspepsia or of the presence of blood in the stools. In the case of each patient with acute abdominal disease it must be remembered that benign tumors are the most common cause of intussusception in adults. This fact should be kept in mind during operations for obstruction due to that disease, since tumors of considerable size have been overlooked after reduction, to be discovered only after they have again caused intussusception and a second operation. It may be remarked here that should expected pathologic changes not be discovered in the stomach, duodenum, or pancreaticobiliary tract at exploratory operations and one wish to search for tumors of the small bowel, the entire small gut must be displaced from behind the omentum and run completely between the fingers. Even with this method, small tumors causing profuse hemorrhage have been undetected, whereas others have been found only because of an opportunity to observe the level at which the dark purple color of the bloody content of the gut betrayed the general location of the tumor.

Difficulties with the diagnosis at operation are emphasized in the reports of 26 tumors which eluded detection until a second operation, of 10 in which only the third operation was successful, and of 3 which were not apprehended until the fourth laparotomy. (References to these cases in which multiple operations were performed before the tumor was discovered and cases in which multiple operations were done for recurring tumors are indicated in the bibliography by ††) There are records of 51 patients who were not so fortunate in persistence of attention, for their tumors were examined at autopsy after unsuccessful searches had been made for them at operation.

In only 79 instances among the 1,014 cases in which the tumor was discovered at operation had the correct preoperative diagnosis been made, each time by means of x-ray studies. This figure includes one case in which the tumor was missed at the first operation and subsequent x-ray studies revealed a polypoid lesion of the duodenum necessitating a second operation; one case with six admissions in 10 years for persistent anemia and, finally, on the sixth admission a repeat small intestinal series demonstrated a polypoid alteration of the mucosal pattern in a short segment of proximal tumor; one case (Jeghers) in which the patient had had one operation for ileal intussusception caused by polyps, a second operation for adhesions, and then prior to the third operation roentgenography led to the diagnosis of polyposis of the small intestine.

Recent discussions of modern methods of roentgen examination of the small intestines by Schatzki, Root, French, Hodes and Edeiken, Dedick and Collins, and Young and Scanlon suggest that in the future more of these tumors will be diagnosed before they cause acute obstruction or long-continued bleeding. These methods consist of (1) serial films made every half hour after the ingestion of 4 ounces of barium suspended in 5 ounces of saline solution, and (2) the "small bowel enema" of thin material given through a long, double lumen tube which has been advanced to a point where (a) it is thought obstruction has been observed or (b) a guaiac-positive specimen is obtained by aspiration. Deviations from normal findings upon which roentgenologic suspicion of small bowel tumors is based, even though a filling defect is not demonstrated, are (1) a delay in the transit of barium through the small bowel (neoplasms of some size may cause no change in motility), (2) any degree of ileus, (3) variable appearances of the mucosa and pressure defects from extraluminal tumors, (4) the observation of peculiar "smears" of barium left behind after the meal has passed, perhaps due to differences in the adhesive character of the mucous membrane overlying a tumor, (5) an irregular pattern of retained barium due to flecks remaining

in the interstices of a tumor, and (6) the observation and correct interpretation of the pedicles of polypoid tumors (Young and Scanlon). Compression roentgenography of suspicious spots has been shown to improve accuracy. Routine studies, carefully done, will demonstrate a high percentage of duodenal tumors and an occasional tumor in the jejunum, while reflux through the ileocecal valve can show up tumors of the last part of the ileum. Special studies of the small bowel are difficult and expensive, and are not advised except when routine studies have failed to demonstrate the findings sought. When these studies have been made "the causes of failure seem to have been disregard of small alterations in the pattern of intestinal loops and an uneven or irregular distribution of the barium due to flocculation or to abnormal motor function of the small intestine" (Dedick and Collins). Certainly the persistence and perceptiveness of the radiologist will be heightened by a high index of suspicion on the part of the clinician to the happy effect that half or more of the symptomatic tumors can be diagnosed.

The diagnosis of intestinal obstruction, cause undetermined, was made correctly with relative frequency, but delay in diagnosis, and particularly in that of strangulating obstructions, is suggested by the number of times inflammatory lesions were named as preoperative diagnostic possibilities, particularly among the earlier records. Consideration of the difficulties and delays in the diagnosis of obstruction due to benign tumors, which were present in two-thirds of the cases reviewed, makes it appropriate to discuss here the routine of diagnostic effort used in each case of suspected intestinal obstruction at the Cook County Hospital, and hence involved in the management of our cases reported here. The routine begins with a carefully taken history and a thorough physical examination. The more violent the course, the more the history should approach "minute by minute" recording. Interns are taught to distinguish between colicky and inflammatory types of pain and to note the relationship of accesses of these to vomiting, audible peristaltic sounds, and the passage of gas or stool. The routine of diagnosis proceeds with the attempt to answer five questions. Does intestinal obstruction exist? If so, at what level? Is obstruction complete? Has vascular damage to the bowel wall occurred? Is surgical exploration indicated?

Intestinal obstruction may be presumed to be present when a second enema fails to bring away gas or stool, and to reduce the girth in a patient with a history of obstipation, nausea, and vomiting. It is unlikely that the obstruction is in the colon if all of a 2 quart enema can be taken. If an ounce of mineral oil is put down the inlying duodenal tube each 4 hours, and a saline enema is given each similar period, and no oil droplets are noted in the returns within 24 hours, the obstruction is effectively complete. There is no infallible rule for determining vascular damage, but elicitation of even slight localized, direct, or indirect abdominal tenderness in a patient with obstruction and altered peristaltic sounds is highly significant, even in the absence of fever, rapid pulse, or other signs of worsening illness. (An intussusceptum may be completely gangrenous without producing tenderness because of its covering of relatively normal bowel, but most other vascular accidents in the gut produce tenderness of some degree, although repeated examinations may be necessary to elicit it.) The peristaltic sounds seldom remain loud, frequent, and synchronous with accesses of colic after vascular damage occurs; colic is then likely to be replaced by continuous pain. It is generally safe to consider surgery necessary whenever complete obstruction is shown to be present and the patient's major deficits, if any, have been corrected.

Adequate use of roentgenography is invaluable in the answering of the questions listed. Surprisingly, relatively few authors mention the use of plain roentgenograms in the diagnosis of intestinal obstruction caused by small bowel tumors. The study of intussusception is aided particularly by plain roentgenography, for flat plates often show not only the usual findings of small bowel gas but also the shadows of both the intussusceptum and intussuscipiens, and, if ileocolic telescoping has occurred, absence of any bowel shadows at all in the right lower quadrant. Successive plates may reveal evidence of spontaneous reduction and recurrence. Barium enemas are useless unless the process involves the colon, although it is possible that the tumor leading the ileocolic intussusceptum might be demonstrated by a barium enema. Few authors advocate the use of "small bowel enemas" in the presence of acute obstruction, perhaps as much because of the difficulties and delays encountered in the passage of the tube as because of anticipated difficulty with the contrast medium.

TREATMENT AND RESULTS

Among the 1,399 original cases collected, 1,091 operations were performed. Earlier authors described enterotomy, enterostomy, short-circuiting, exteriorization, and staged operations, occasionally primary resections and anastomoses, many by means of Murphy buttons. Few of the later authors treated their patients with incomplete or temporizing operations and their reports indicate an increasing tendency to deal with these tumors and resultant obstructions by definitive one-stage operations. The remarkable improvement in results noted in the reports made during the past 20 years must be due as much to improved understanding and handling of the problem of intestinal obstruction as to the availability of antibiotics.

For tumors not causing obstruction the most consistently successful treatment has been enterotomy and excision of the tumor, or wedge-shaped, diamond-shaped, or segmental resections of the tumor and adjacent bowel. Recurrence has been noted when simple reductions of intussusceptions have been done in adults, and even (for ileocecal types) in children. A tumor of considerable size may be difficult to feel in a swollen segment of bowel, hence exploration of the lumen should follow the reduction of viable bowel.

Some later authors have discussed the restoration of fluid, electrolyte, and nitrogen balance in connection with the preoperative and postoperative management of cases with obstruction, and others have investigated the postoperative metabolism in patients whose multiple tumors required the resection of long portions of intestine. The treatment of choice for nonobstructing tumors is, of course, simple resection of the tumor through an enterotomy opening if such is possible, or with a portion of bowel wall, and primary closure. If obstruction exists, diagnostic management as outlined earlier, with attention to the correction of deficits, preoperative and postoperative decompression, the use of blood and of antibiotics, and prompt operative intervention for complete or strangulating obstruction are essential.

The results of treatment were not stated in 101 instances. Among the remaining 960 patients subjected to surgery there were 199 deaths, an over-all mortality of 20.6 per cent. The percentage of deaths relative to operations has shown a steady and gradual decrease during the past 20 years. Not all patients operated upon had intestinal obstruction, partly explaining why the mortality figures are better than those applying to all types of intestinal obstruction. In discussing the mortality and prognosis of small bowel obstructions, Mayer, Stein, and Meyer (1952) noted that in series of patients subjected to primary resection and anastomosis in various hospitals the mortality figures of 52 to 73 per cent were reported between 1929 and 1942. In contrast to these figures they describe an over-all mortality rate of only 20 per cent in 105 consecutive cases of small bowel resection for obstruction at the Cook County Hospital. Of the 22 patients considered moribund at the time of operation, 11 survived, demonstrating that under present conditions surgery for small bowel obstruction should not be withheld even in the poorest risk group. The mortality rate for intussusception due to tumor is lower than that for all small bowel obstructions combined probably because of the younger age groups involved and because the peritoneum is protected from the contents of strangulated gut for so much longer periods than if no ensheathing layer exists.

COOK COUNTY HOSPITAL CASES

Prior to the period of our study, Lawrence reported the occurrence of 15 polyps among 7,000 autopsies at the Cook County Hospital. In 4 cases there were polyps elsewhere in the gastrointestinal tract. Five of the polyps were in the duodenum, 6 in the jejunum, and 4 in the ileum. Later, Kirshbaum described the discovery of 12 benign tumors of the small bowel among 5,754 autopsies at the same institution. Six were lipomas, 4 fibromyomas, and 2 lymphangiomas. During the period from 1939 to 1953, inclusive, there were 18 such tumors among the 117,533 surgical specimens examined in the surgical pathology laboratory. (Two 1955 cases are included in the total of 20 original ones reported here.) There were 2 cases of melanin pigmentation-multiple adenomatosis, 3 of polyps, 1 case of lipoma, 2 cases of angioma, 2 of fibromyoma, 5 of fibroma, 4 of neurogenic tumor, and 1 case of multiple telangiectasis. This last case terminated in the only death in the series. It was mentioned in slight detail in the paragraph on severe bleeding. The multiple adenomatous polyps removed from the 40 year old female with melanin pigmentation were found in the duodenum, jejunum, ileum, and colon. The duodenal adenomas

found at autopsy in the 63 year old father of this patient had been shown on x-ray films 3 years before his death from pulmonary cancer. Examinations were made at that time because of ulcerlike symptoms. He also had melanin pigmentation of the mouth and lips.

The patients who had these tumors ranged in age from 8 to 77 years of age. Eighteen of the tumors were found at operation and 2 at autopsy. Of the solitary tumors, 1 was in the duodenum, 3 were in the jejunum, and 13 in the ileum. Six tumors were discovered incidentally at operations not related to their presence, 9 because of a diagnosis of intestinal obstruction, and the multiple adenomas at an operation to remove a colonic polyp, one because of the presence of blood in the stools and one because of the diagnosis of small bowel tumor.

Four of the patients with intestinal obstruction were found to have intussusceptions, one of these being an ileoileocolic telescoping. The multiple small bowel adenomas were found because the small bowel was observed to be telescoping and disengaging in numerous places when the abdomen was opened. The other obstructions were caused once by barium, once by encroachment of the tumor, and in 3 instances by mechanisms not specified on the charts, but apparently either compression or encroachment. A large polyp of the duodenum discovered at duodenotomy for exploration of the papilla of Vater was resected without bowel, but in the remaining 17 cases the tumors were removed either by segmental resections and primary anastomosis, or by either wedge-shaped or diamond-shaped resections of the bowel wall with the tumor. Recovery ensued in all cases.

Data from these 20 cases from the Cook County Hospital have been utilized in the preceding discussions and incorporated in the tabulations both preceding and to follow.

Under appropriate headings the following paragraphs and tables give in some detail the data concerning specific types of tumors listed in Table I. Under each heading comparable data will be found similarly numbered.

1. Adenomas were operative findings in 174 cases. The tumor was not found at operation, but discovered later at autopsy in 9 cases and was a primary autopsy finding in 40 cases. The circumstances of discovery were not stated in 4 instances.

2. Adenomas were located in the ileum in 72 cases, in the duodenum in 73, jejunum in 47, jejunum and ileum in 6, duodenum and jejunum in 4, entire small intestine in 10, and in the entire gastrointestinal tract in 4; the exact site in the small bowel was unspecified in 11 cases. The tumors were intraluminal in 209 cases, extraluminal in 1 case, intraluminal and extraluminal in 1, intramural in 9 cases, and unstated in 3 cases.

TABLE VI.—ADENOMAS; AGE AND SEX INCIDENCE —227 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
Under 1 year	6	1	1	8
1– 9 years	9	6[a]	2	17
10–19 years	16[a]	17	—	33
20–29 years	25	16	—	41
30–39 years	15	17	—	32
40–49 years	19	17[a]	—	36
50–59 years	9	12	—	21
60–69 years	9	9	—	18
70–79 years	2	2	—	4
80–89 years	1	—	—	1
Not given	7	1	8	16
Total	118	98	11	227

(a) Cases of multiple operations for recurring tumors. (Williams and Williams; Camp and Lesser; Hillemand *et al.*; Amesur)

3. The incidence of symptoms and findings was as follows: pain in 158 cases, nausea and vomiting in 129, intestinal hemorrhage in 70, constipation and obstipation in 49, palpable mass in 62, abdominal distention in 40, emaciation and weight loss in 39, and diarrhea in 27.

4. Intestinal obstruction was present in 150 instances. Of 119 intussusceptions 2 were quadruple, 1 was triple, and 10 were double. Among 5 patients with intussusception and volvulus, 1 patient had double intussusception. Volvulus alone was present in 1 case. Tumor encroachment caused obstruction in 25 cases. One patient undergoing 3 operations was subjected to invagination, volvulus, and 2 invaginations respectively.

5. The preoperative diagnosis of intestinal tumor was made in 17 cases (in 1 case it was made before the second operation).

6. Recovery from surgery ensued in 138 cases and death in 27 cases. The results of surgery were not stated in 18 cases.

1. Polyps were operative findings in 122 cases. The tumor was not found at operation but discovered later at autopsy in 16 cases and was a primary autopsy finding in 29 cases. The circumstances of discovery were not stated in 2 cases. One patient, a male 27 years of age, was treated with blood transfusions on the basis of gastrointestinal x-ray examination which revealed multiple polyposis of the entire gastrointestinal tract.

TABLE VII.—POLYPS; AGE AND SEX INCIDENCE—170 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
Under 1 year	5	—	—	5
1– 9 years	7	9	—	16
10–19 years	9	23[a]	1	33
20–29 years	19[c]	16	—	35
30–39 years	15	6	—	21
40–49 years	10	7	—	17
50–59 years	12	8	—	20
60–69 years	4	7[b]	—	11
70–79 years	3	2	—	5
Not given	—	3	4	7
Totals	84	81	5	170

(a) One case (Cook County Hospital) was in a female, 18; only symptom was positive benzidine test on stool noted incidental to hospital admission for elective pelvic surgery.

(b) One case (Cook County Hospital) was in a female, 66. A large polyp of the duodenum was discovered accidentally at transduodenal exploration of papilla. Resection and recovery.

(c) Includes Glass' case in a male of 27 years on whom operation was not performed.

At the time Glass (1940) reported this case the patient was still living.

2. Polyps were located in the duodenum in 18 cases, duodenum and jejunum in 1 case, duodenum and small intestine (exact site not stated) in 1, in the jejunum in 29 cases, jejunum and ileum in 3, ileum in 84, ileum and ileocecal valve in 2, ileocecal valve in 2, and in the entire small intestine in 11; the exact site in the small intestine was not specified in 19 cases. All of the polyps were intraluminal.

3. The incidence of symptoms and findings was as follows: pain in 134 cases, nausea and vomiting in 120, constipation and obstipation in 70, palpable mass in 54, abdominal distention in 56, intestinal hemorrhage in 50, emaciation and loss of weight in 25, diarrhea in 18, and dyspepsia in 2.

4. Intestinal obstruction was present in 142 instances. Of 127 intussusceptions, 11 were double and 2 were triple. Among 4 cases of intussusception and volvulus, 1 case was a double volvulus. Tumor encroachment caused obstruction in 10 cases.

5. In 10 cases the preoperative diagnosis of intestinal tumor was confirmed at operation.

6. Recovery from surgery ensued in 88 cases and death in 44, while the results of surgery were not stated in 6 reports.

1. Polyposis (adenomatosis) with melanin pigmentation (Peutz-Jeghers' syndrome) was the operative finding in 53 cases. In 1 case it was an autopsy finding (Cook County series); the duodenal adenomas were diagnosed with x-rays during life but the patient refused operation and 3 years later died from carcinoma of the lung. In 5 cases (Peutz) the data were inadequate to determine whether the tumors were operative or autopsy findings.

Multiple operations were performed in 34 of the patients as follows: 2 operations in 18; 3 operations in 7; 4 operations in 3; 5 operations in 1 patient; 6 operations in 3 patients; 7 operations in 1 patient; and "several" in 1 patient.

2. Polyposis was located in the duodenum in 1 patient, in the duodenum, jejunum, and ileum in 10 patients, jejunum, ileum, and large bowel in 5, jejunum and stomach in 1 patient, stomach, duodenum, and large bowel in 1, jejunum in 10 patients, duodenum, jejunum, ileum, and large bowel in 2, stomach, jejunum, and ileum in 1 patient, small bowel (exact site unspecified) and large bowel in 3 patients, small bowel (unspecified) in 3, jejunum and ileum in 2, stomach, jejunum, ileum and large bowel in 5, duodenum, jejunum, and ileum in 1 patient, and in the jejunum and large bowel in 1; the exact bowel site was unspecified in 8 patients, in the duodenum, small bowel (unspecified), and large bowel in 1 patient, stomach, duodenum, jejunum, ileum, and large bowel in 2 patients, and in the jejunum and small bowel (unspecified) in 1 patient.

3. The incidence of symptoms and findings was as follows: pain in 40 cases, vomiting in 28, palpable mass in 20, occult blood in 10, constipation in 11, diarrhea in 7, anemia in 4, melena in 8, hemorrhage in 3, and hematemesis in 3.

TABLE VIII.—POLYPOSIS (ADENOMATOSIS) WITH MELANIN PIGMENTATION (PEUTZ-JEGHERS SYNDROME); AGE AND SEX INCIDENCE—59 CASES

Age	*Male*	*Female*	*Total*
1– 9 years	2	4	6
10–19 years	9	9	18
20–29 years	7	9	16
30–39 years	—	6	6
40–49 years	—	1	1
50–59 years	1	1	2
60–69 years	1	—	1
70–79 years	1	—	1
Not given	6	2	8
Totals	27	32	59*

*This figure includes Peutz' 7 proved cases, although complete data were not available in 5 of his cases (3 cases showed malignant degeneration). Also the following cases with malignant degeneration of some of the polyps have been included: Troxell (male of 77 years); Brayton & Norris (female of 15 years); Smith (female of 29 years); Weber (female of 15 years); Fisher (male of 7 years); Basu (female of 25 years); Jeghers (female of 22 years). Not included in the above figures are "probable" cases, i.e., diagnosis was based on clinical history and the appearance of the syndrome in other family members, or x-ray diagnosis was made but not verified at surgery or autopsy.

(The Peutz-Jeghers' syndrome with polyposis will be analyzed in more detail by the authors in a paper now in preparation.)

4. Intussusception was present in 36 cases. In one of these 36 the intussusception was spontaneously reduced (Cook County case); in 2 cases there were 2 separate intussusceptions; in another 2 there were double intussusceptions; in 1 case the intussusception was triple, and in another case there was torsion of 180 degrees on the mesentery.

5. X-ray diagnosis of intestinal polyposis with subsequent operation was made in 10 cases by: Jeghers (2 cases, 1 diagnosed before the third operation), Schaffer and Sachs, Bruwer et al., Lima Basto, Bradford and Danzig, Savage, Goldberg and Goldhaber (diagnosed before second operation), and Waugh; 1 case was diagnosed at Cook County Hospital.

6. Recovery from surgery ensued in 45 cases and death in 5; the results of surgery were not stated in 3 reports.

7. The familial incidence of cases was tabulated in Table VIII by: Jeghers (mother, 30; daughter, 9); Jeghers (brother 28; sister 24); van Dijk and Oudendal (brother 16; sister 15); Cook County cases (father, 63; daughter 40); Crone (2 sisters of triplets); Rankin and Laird (father, age unstated; son, 6).

Case of Bruwer *et al.*: the patient's mother stated that one of her sons had been operated on for polyps and 2 other sons were "now showing symptoms of stomach trouble."

Basu's patient, aged 25, stated that her mother died with undiagnosed abdominal pain and she also had similar pigmentation of her lips and cheek. Three living brothers also have pigmentation but no abdominal symptoms.

One Cook County patient stated, "All my relatives have the pigmentation since my father's father." X-ray diagnosis of duodenal and jejunal polyps was made in a paternal aunt, aged 60, and uncle, aged 62. The aunt had had "stomach trouble and black stools" for years. The uncle had suffered from indigestion during his whole lifetime.

Case of Cope (1922) and Wolff (1952): at the time Cope reported the case the pigmentation was not noted. The patient had 5 children, of whom 4 were alive. One son died at the age of 5, after an operation for intussusception. He had the melanin pigmentation. There was no information as to whether polyps were present. Two other children have similar pigmentation and another child has no abnormal pigmentation but has several pale-brown freckles on his face.

TABLE IX.—LIPOMAS; AGE AND SEX INCIDENCE—219 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	1[b]	—	—	1
10–19 years	2	3	—	5
20–29 years	4[e]	6	—	10
30–39 years	10	16[c]	—	26
40–49 years	21[c]	20	—	41
50–59 years	28[c]	23[e]	—	51
60–69 years	21[c,d]	15[c]	—	36
70–79 years	9	9[a]	—	18
80–89 years	—	1	—	1
90 and over	1	—	—	1
Not given	3	3	23[e]	29
Total	100	96	23	219

(a) One case was in a female of 77 years, with a lipoma of the small intestine, neurofibromatosis of the skin and intestinal wall (exact site not given), and diffuse neurofibromatosis in the left eye and appendix (Heine, 1927).
(b) Fibromyxolipoma of the ileum in a male of 4½ years (Willems, Leplat, and Talpaert, 1950).
(c) Fibrolipomas reported by Odelberg (male of 48 years; another patient, age and sex not given); Delannoy, Paris and LaGache (male of 54 years); Razzaboni (male of 62 years); Vercellotti (male of 60 years); Balgarnie (female of 68 years); Bouvier (female of 35 years); Swanson (male of 59 years); Latouche (male of 38 years); Meldolesi (male of 27 years).
(d) One case with multiple lipomas, fibromas and polyps (one polyp sarcomatous) of stomach, and small and large intestine (Enslin, 1902).
(e) A unique case of lipoma destruens in a female of 55 years (Zaaijer, 1954).

Young's patient, 32 years of age, has 3 children, but only 1, 6 years of age, has the pigmentation and recently her stools have been observed to be black.

1. Lipomas were operative findings in 145 cases. The tumor was not found at operation, but discovered later at autopsy in 6 cases and was a primary autopsy finding in 64 cases. The circumstances of discovery were not stated in 4 instances.

2. Lipomas were located in the duodenum in 35 cases, in the jejunum in 34, jejunum and ileum in 2, ileum in 113, and at the ileocecal valve in 13; and the exact site in the small bowel was unspecified in 22 cases. The tumors were intraluminal in 161 cases, extraluminal in 7, intraluminal and extraluminal in 12, intraluminal, extraluminal, and intramural in 2, annular in one case, intramural in 12 cases, and not indicated in 24 cases.

3. The incidence of symptoms and findings was as follows: pain in 134 cases, nausea and vomiting in 93, constipation and obstipation in 62, abdominal distention in 46, palpable mass in 55, emaciation and weight loss in 21, diarrhea in 28, and intestinal hemorrhage in 32 cases.

4. Intestinal obstruction was present in 136 instances. Of 114 intussusceptions 5 were double. Volvulus was present in 2 cases, and volvulus and intussusception were present in 5 cases. Ob-

TABLE X.—MYOMAS; AGE AND SEX INCIDENCE—179 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	2	2	1	5
10–19 years	—	2	—	2
20–29 years	7[a]	6	1	14
30–39 years	10	15[a]	—	25
40–49 years	22	17[a]	—	39
50–59 years	23[a,b]	20[d]	—	43
60–69 years	13	13[a,c]	—	26
70–79 years	5	4	—	9
80–89 years	3	1	—	4
Not given	3	4	5	12
Total	88	84	7	179

(a) One case (female of 62 years) had multiple skin neurofibromas (von Recklinghausen's disease), but the jejunal tumor was a leiomyoma (Brekke, 1948). One case (male of 25 years) had multiple cutaneous neurofibromas and a leiomyoma of duodenum (Campbell and Young, 1954). One case (female of 48 years) with von Recklinghausen's disease and a leiomyoma of the jejunum (Beigler, 1950). One case reported by Modrzejewski, 1882, was in a female of 37 years whose entire body was covered with over 3,000 fibromatous nodules. No symptoms were referable to intestinal tumor. The patient died in a marasmic state. At autopsy a myoma of the jejunum was found. One case reported by Bouvier, 1924, was in a male of 50 years who had multiple cutaneous neurofibromatosis and a myoma of the duodenum. One case in a female of 69 years, reported by Ebert *et al.*, 1942, also had a neurofibroma of the duodenum and a hemangioma of the ileum.

(b) One case reported by Roux, Negre and Marchal, 1950, was an angioleiomyoma of the jejunum undergoing microcystic transformation in a male of 50 years. One case reported by Kunz, 1925, was a lipomyoma of the ileum in a male of 54 years.

(c) One case of a jejunal hemangiomyoma in a female of 60 years (Goldberg, 1939).

(d) One case reported by Tomsykoski *et al.*, 1954, had the combination of adrenal pheochromocytoma and leiomyoma of the jejunum. Diagnosis was difficult because the patient had manifestations of two separate entities.

struction was caused by compression in 2 cases, compression and encroachment in 3, and tumor encroachment alone in 11 cases.

5. The preoperative diagnosis of intestinal tumor was made in 8 instances.

6. Recovery from surgery ensued in 99 cases and death in 32; the results of surgery were not stated in 20 reports.

1. Myomas were operative findings in 129 cases. The tumor was not found at operation, but discovered later at autopsy in 7 cases and was a primary autopsy finding in 39 cases. (One patient had, in addition to the leiomyoma of duodenum, a neurofibroma of the duodenum and a hemangioma of the ileum.) The circumstances of discovery were not stated in 4 instances.

2. Myomas were located in the duodenum in 32 cases, jejunum in 53, ileum in 69, and in the entire small intestine in 3; the exact site in the small bowel was unspecified in 22 cases. The tumors were intraluminal in 52 cases, extraluminal in 77, intraluminal and extraluminal in 19, intramural in 14, annular in 3, and unstated in 14 reports.

3. The incidence of symptoms and findings was as follows: pain in 105 cases, nausea and vomiting in 69, constipation and obstipation in 43, abdominal distention in 29, palpable mass in 49, emaciation and weight loss in 26, diarrhea in 15, dysuria in 4, intestinal hemorrhage in 87, suppression of urine in 1 case, and loss of appetite in 13 cases.

4. Intestinal obstruction was present in 82 instances; intussusception was present in 25 and volvulus in 9. Obstruction was caused by compression in 30 cases, compression and encroachment in 3, and tumor encroachment alone in 15.

5. The preoperative diagnosis of intestinal tumor was made in 10 instances.

6. Recovery from surgery ensued in 94 cases and death in 24; the results of surgery were not stated in 18 reports.

1. Fibromas were operative findings in 127 cases. The tumor was not found at operation, but discovered later at autopsy in 4 cases, and was a primary autopsy finding in 21 cases. The circumstances of discovery were not stated in 11 instances.

2. Fibromas were located in the duodenum in 6 cases, jejunum in 20, ileum in 110, ileocecal junction in 2, and there were fibromas distributed in the jejunum, ileum, stomach, and duodenum in 1 case; in another case there were 15 to 20 fibromatous nodules in the jejunum and ileum. The exact site in the small bowel was unspecified in 23 reports. The tumors were intraluminal in 114 cases, extraluminal in 22, intraluminal and extraluminal in 6, annular in 1 case, intramural in 4 cases, and unstated in 16 reports.

3. The incidence of symptoms and findings was as follows: pain in 116 cases, nausea and vomiting in 93, constipation and obstipation in 78, abdominal distention in 57, palpable mass in

TABLE XI.—FIBROMAS; AGE AND SEX INCIDENCE—163 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	1	4	—	5
10–19 years	2	2	—	4
20–29 years	9	8	—	17
30–39 years	12[d]	22[d]	—	34
40–49 years	16[c]	14	—	30
50–59 years	19[b]	19[d]	—	38
60–69 years	10	8[a]	—	18
70–79 years	2	—	—	2
Not given	7	2	6	15
Total	78	79	6	163

(a) Case reported by Lichtenstein and Dutra, 1943, is an angiofibroma in a female of 68 years causing double intussusception.

(b) A case of lipofibroma in a male of 57 years reported by Lawler, Ragins and Silverstein, 1947.

(c) Leriche's case, 1911, is one of generalized neurofibromatosis and multiple fibromas in the jejunum, ileum, and gastroduodenum.

(d) Hashemian's 3 cases of familial fibromatosis, 2 of which had pigmentation like that in von Recklinghausen's disease.

45, intestinal hemorrhage in 30, diarrhea in 25, emaciation and weight loss in 32, dysuria in 2, hematuria in 2, loss of appetite in 4 and frequency of micturition in 2 cases.

4. Intestinal obstruction was present in 138 instances. Of 105 intussusceptions, 2 were double and 1 was multiple. Volvulus alone was present in 3 cases and there was intussusception and volvulus in 1 case. Obstruction was caused by compression in 11 cases, compression and encroachment in 2, and tumor encroachment alone in 10. Chronic obstruction (type not given) was reported in 3 instances, and obstruction caused by strangulated hernia which contained ileum with an extraluminal fibroma in 1 case, and obstruction by torsion of the pedicle in 1 case.

5. The preoperative diagnosis of intestinal tumor was made in 7 instances.

6. Recovery from surgery ensued in 94 cases and death in 21; the results of surgery were not stated in 16 reports.

ANGIOMAS AND HEMANGIOMAS

Vascular tumors of the small intestine behave clinically in much the same way that others do, with the exception that they have a greater tendency to bleed and to continue bleeding, because of the absence of muscular and elastic tissue in the walls of their vessels. Among the tumors studied, these were the only ones showing a marked predilection for the male sex (3 to 2). Vascular tumors included some of the smallest and some of the most extensive tumors which we found reported; in some cases the extent of telangiectasia had precluded surgery. The diffuse expansive type of cavernous hemangioma has been described as a single contiguous lesion stretching along the bowel for as long as 25 inches (Gentry, Dockerty, and Clagett). In such cases repeated injections of moccasin venom or the administration of rutin has been tried with intent to reduce the tendency to bleed.

Vascular tumors of the gastrointestinal tract have been classified variously as follows:

Kaijser:

1. Multiple phlebectasia
2. Single cavernous hemangioma
3. Simple capillary hemangioma
4. Hemangiomatosis with localization in the gastrointestinal tract

Hansen's classification is based on histology and the lesions are divided into three groups:

1. Simple hemangioma consisting of capillaries, dilated or nondilated, and separated by little or abundant fibrous strands
2. Cavernous hemangioma consisting of large blood-filled communicating spaces lined by endothelium and having little or no stroma
3. Combined hemangioma presenting combinations of the two previous types

Gentry, Dockerty, and Clagett (Mayo Clinic):

Benign vascular lesions

- A. Telangiectasis (hereditary and nonhereditary types)
- B. Hemangioma
  1. Capillary hemangioma (simplex, mostly single)
  2. Mixed capillary and cavernous hemangioma
  3. Cavernous hemangioma
     - a. Multiple phlebectasia (small cavernous)
     - b. Simple polypoid (single cavernous)
     - c. Diffuse expansive (single contiguous)
     - d. Diffuse expansive (multiple noncontiguous)

Malignant vascular lesions

- A. Hemangioendothelioma
- B. "Benign metastasizing hemangioma"
- C. Kaposi's sarcoma
- D. Angiosarcoma

1. Angiomas and hemangiomas were operative findings in 64 cases. The tumor was not found at operation, but discovered later at autopsy in 5 cases and was a primary autopsy finding in 45 cases. Circumstances of discovery were not stated in 13 instances.

2. Angiomas and hemangiomas were located in the duodenum in 8 cases, the jejunum in 32, ileum in 36, ileum and jejunum in 9, stomach and jejunum in 1 case, small intestine and colon in 1, the entire small intestine in 11 cases, and in the gastrointestinal tract in 3; the exact site in the small bowel was unspecified in 26 reports.

3. The incidence of symptoms and findings was as follows: pain in 42 cases, constipation and obstipation in 13, nausea and vomiting in 27, intestinal hemorrhage in 55, diarrhea in 5, palpable mass in 14, abdominal distention in 11, emaciation and loss of weight in 9, weakness in 9, hematuria in 1 case, hematemesis (ulcer?) in 1, and vaginal bleeding in 1.

TABLE XII.—ANGIOMAS AND HEMANGIOMAS; AGE AND SEX INCIDENCE—127 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
Under 1 year	1	4	—	5
1– 9 years	2	4	1	7
10–19 years	9	7	—	16
20–29 years	7	8	—	15
30–39 years	6	8[a]	—	14
40–49 years	15	7[b]	—	22
50–59 years	12	4	—	16
60–69 years	12	4	—	16
70–79 years	3	2	—	5
80–89 years	2	—	—	2
Not given	—	—	9	9
Total	69	48	10	127

(a) One case of a female negress of 39 years, who had capillary hemangiomas coexisting with Addison's disease.
(b) Cook County Hospital case of obstruction with barium meal in female of 46 years.

4. Intestinal obstruction was present in 38 instances. Of 18 intussusceptions, 2 were double. Volvulus alone was present in 1 case. Obstruction was caused by compression in 8 cases, tumor encroachment alone in 9 cases, and annular stenosis in 1 case. Obstruction due to a barium meal occurred in one of the Cook County Hospital cases.

5. In 3 cases the preoperative x-ray diagnosis of possible benign tumor of the small intestine was confirmed at operation.

6. Recovery from surgery ensued in 48 cases, death in 13, and the results of surgery were not stated in 5 instances. Two patients undergoing exploratory operations were found to have such extensive involvement that surgery was inadvisable. Patients were still having further hemorrhages at the time the reports were published.

Details from the exhaustive review of Gentry *et al.* will be found in Section II.

1. Fibromyomas were operative findings in 68 cases. The tumors were not found at operation, but discovered later at autopsy in 2 cases and were a primary autopsy finding in 7 cases. Circumstances of discovery were not stated in 4 instances.

TABLE XIII.—FIBROMYOMAS; AGE AND SEX INCIDENCE—81 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	—	—	—	—
10–19 years	2	—	—	2
20–29 years	6	2	1	9
30–39 years	4	13	—	17
40–49 years	12	5	—	17
50–59 years	10	5	—	15
60–69 years	6[a]	7	—	13
70–79 years	2	1	—	3
Not given	—	1	4	5
Total	42	34	5	81

(a) One case reported by Kleitsch, Kehne, and Gutch in 1951 presented a generalized neurofibromatosis. Numerous tumor nodules were found extending throughout the length of the small bowel. The pathologic report was fibromyoma of the small bowel.

2. Fibromyomas were located in the duodenum in 12 cases, jejunum in 17, ileum in 35, and in the jejunoileum junction in 2; the exact site in the small bowel was unspecified in 15 instances. The tumors were intraluminal in 38 cases, extraluminal in 30, intraluminal and extraluminal in 5, intramural in 2, and the site of the tumors was unstated in 6 reports.

3. The incidence of symptoms and findings was as follows: pain in 51, nausea and vomiting in 38, palpable mass in 26, constipation and obstipation in 35, abdominal distention in 21, diarrhea in 8, intestinal hemorrhage in 29, emaciation and weight loss in 17, and symptoms of intestinal obstruction in 19.

4. Intestinal obstruction was present in 62 instances. Of 31 intussusceptions, 1 was double. Of 5 cases of volvulus, 1 was incomplete torsion, and 1 was a double volvulus. Obstruction was caused by compression in 15 cases, compression and encroachment in 1 case, and tumor encroachment alone in 10 cases.

5. In 3 cases the preoperative x-ray diagnosis of duodenal tumor was confirmed at operation; 1 case of intestinal obstruction by tumor was confirmed at operation as an ileal tumor.

6. Recovery from surgery ensued in 50 cases, death in 15, and the results of surgery were not stated in 5 instances.

NEUROGENIC TUMORS

There is much confusion regarding the classification of intestinal tumors arising in nerve elements and because of this uncertainty in terminology it is difficult to estimate accurately the number of cases reported. In all probability many of the tumors earlier classified as fibromata or myomata* would be designated as neurofibromas by present day pathologists. Various terms, such as neurinoma, schwannoma, fibroblastoma, neurilemmoma, neurogenic fibroma, neurofibroma, plexiform sarcoma, and fusosarcoma, have been used to describe the structure or origin of the growth. For this reason we have considered all the cases reported as neurofibromas, neurinomas, and ganglioneuromas in one group, and classified them as neurogenic tumors. These tu-

*See footnotes to tables on fibromas and myomas. For example, Negri classifies Leriche's case as a multiple neurofibromatosis of the intestine. We have tabulated it under fibroma.

mors may be either benign or malignant, and cases have been reported in which at operation the tumor appeared to be benign, but later (2 or more years) death from metastases ensued.

Sjövall found 2 cases of neurinomas in the small intestine in 31,331 autopsies. Cedermark at the Caroline Hospital Surgical Clinic, Stockholm, Sweden, observed 3 cases of neurinoma in the small intestine since 1940. Among 27 cases of neuromas of the gastrointestinal tract reported by Piringer-Kuchinka, 4 were in the small intestine. Six neurogenic tumors of the small bowel were encountered during a 20 year period at the Chirurgische Universitätsklinik in Wien (Spängler, 1953).

1. Neurogenic tumors were operative findings in 64 cases. The tumor was not found at operation, but discovered later at autopsy in 2 cases and was a primary autopsy finding in 11 cases. Circumstances of discovery were not stated in 13 instances.

2. Neurogenic tumors were located in the duodenum in 6 cases, jejunum in 18, jejunoileum in 3, jejunum and stomach in 1 case, the ileum in 32 cases (in one case the ileal tumor was found on operation, but at autopsy a duodenal neurofibroma was also found), entire small intestine in 2, small intestine and stomach in 1 case, small intestine, colon, cecum, and mesentery in 1, and in the ileum, cecum, and ascending colon in 1; the exact site in the small bowel was unspecified in 25 reports. The tumors were intraluminal in 18 cases, extraluminal in 25, intraluminal and extraluminal in 6, intramural in 6, annular in 1 case, extraluminal and intramural in 1, and unstated in 33 reports.

3. The incidence of symptoms and findings was as follows: pain in 37 cases, nausea and vomiting in 26, sensation of hardening in abdomen in 1 case, sensation of weight in abdomen in 4 cases, palpable mass in 22, intestinal hemorrhage in 32, diarrhea in 10, abdominal distention in 11, frequency of micturition in 1 case, constipation and obstipation in 11 cases, emaciation and weight loss in 5, and cachexia in 2.

4. Intestinal obstruction was present in 27 instances. Intussusception was present in 7 cases, volvulus in 2, annular stenosis in 1 case, and mechanical chronic obstruction in 4 cases. Obstruction was caused by compression in 8 cases and by tumor encroachment in 5.

5. In 2 cases the preoperative x-ray diagnosis of duodenal tumor was confirmed at operation.

TABLE XIV.—NEUROGENIC TUMORS; AGE AND SEX INCIDENCE—90 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	1	—	—	1
10–19 years	1[c]	1[d]	—	2
20–29 years	1	1	—	2
30–39 years	6[a,d]	4	—	10
40–49 years	15[a]	7[a]	1	23
50–59 years	9[a,b]	15[a]	—	24
60–69 years	5	10[a]	—	15
70–79 years	2	1	1	4
Not given	2	2[a]	5	9
Total	42	41	7	90

(a) Grill and Kuzma (female of 60 years, with von Recklinghausen's disease of entire body); Weber (female of 47 years, with typical von Recklinghausen's neurofibromatosis); Adrian (female of 56 years, with multiple neurofibromatosis of skin); Branca (male of 48 years, with generalized neurofibromatosis of the skin); Shaw (male of 47 years, with von Recklinghausen's disease of the skin); von Balen (female, age not given, with skin neurofibromatosis—intestinal tumor was a neurofibroangioma); Parker (female of 54 years, with von Recklinghausen's disease of the skin); Warshauer and Nelson (male of 31 years, with cutaneous von Recklinghausen's disease—intestinal tumor was a perforated jejunal neurofibroma); Baumeister (male of 51 years, with neurofibromatosis of the skin). Feyrter's 3 cases (female of 46 years, female of 49 years, male of 40 years) had cutaneous neurofibromatosis. Shaiken (female with cutaneous neurofibromatosis—intestinal tumor was a neurofibroma of jejunum). Iglesias Betancourt's case was a patient of 63 years with cutaneous von Recklinghausen's disease and multiple neurofibromatosis of the jejunum and ileum coexisting with a carcinoid of the intestine.

(b) Barco designates his case as a benign leiomyofibromatous schwannoma (neurinoma) in a male of 57 years.

(c) One case in the Cook County Hospital series was a ganglioneurofibroma in a male of 19 years, with intussusception.

(d) One case reported by Poate and Inglis was a ganglioneuromatosis of the ileum, cecum, and ascending colon in a male of 30 years. One case reported by MacMahon and Davies was a plexiform ganglioneuroma of the ileum in a female of 16 years.

In 3 cases x-ray diagnosis of a jejunal lesion was confirmed at operation.

6. Recovery from surgery ensued in 47 cases, death in 10, and the results of surgery were not stated in 9 instances.

1. Fibromyxomas and myxofibromas were operative findings in 24 cases. The tumor was a primary autopsy finding in 2 cases.

2. The fibromyxomas and myxofibromas were located in the duodenum in 1 case, the jejunum in 2 cases, and in the ileum in 18; the exact site in the small bowel was unspecified in 5 reports. The tumors were intraluminal in 25 cases and extraluminal in 1 case.

TABLE XV.—FIBROMYXOMAS AND MYXOFIBROMAS; AGE AND SEX INCIDENCE—26 CASES

Age	*Male*	*Female*	*Total*
1– 9 years	—	—	—
10–19 years	—	1	1
20–29 years	2	2	4
30–39 years	1	3	4
40–49 years	1	5	6
50–59 years	4	1	5
60–69 years	2	3	5
70–79 years	1	—	1
Total	11	15	26

TABLE XVI.—LYMPHANGIOMAS; AGE AND SEX INCIDENCE—18 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
Under 1 year	—	—	1	1
1– 9 years	1	2	—	3
10–19 years	2	—	—	2
20–29 years	—	3	—	3
30–39 years	3	—	—	3
40–49 years	2	1	—	3
50–59 years	1	1	—	2
60–69 years	—	—	—	—
70–79 years	1	—	—	1
Total	10	7	1	18

3. The incidence of symptoms and findings was as follows: pain in 23 cases, nausea and vomiting in 20, constipation and obstipation in 15, abdominal distention in 14, palpable mass in 9, emaciation and weight loss in 6, diarrhea in 1 case, intestinal hemorrhage in 2 cases, and oliguria in 1 case.

4. Intestinal obstruction was present in all 26 cases. Of the 22 intussusceptions, 1 case was double. Obstruction was caused by compression in 1 case and by tumor encroachment alone in 3 cases.

5. In only 1 case was the preoperative x-ray diagnosis of tumor of the ileum confirmed at operation.

6. Recovery from surgery ensued in 18 cases, death in 3, and the results of surgery were not stated in 3 reports.

1. Lymphangiomas were operative findings in 12 cases. The tumor was a primary autopsy finding in 5 cases and the circumstances of discovery were not stated in 1 instance.

2. Lymphangiomas were located in the duodenum in 1 case, in the jejunum in 4 cases, the ileum in 9, and in 1 case the entire small intestine was affected with lymphangiectasis. In 3 reports the exact site in the small intestine was not specified.

TABLE XVII.—FIBROADENOMAS; AGE AND SEX INCIDENCE—15 CASES

Age	*Male*	*Female*	*Total*
1– 9 years	1	1	2
10–19 years	—	2	2
20–29 years	1	1	2
30–39 years	1*	—	1
40–49 years	1	3	4
50–59 years	—	—	—
60–69 years	2	—	2
70–79 years	—	2	2
Total	6	9	15

*Salaris' case was classified as a fibroadenoma although the microscopic report was papillomatous hyperplasia of the entire duodenal mucosa. This patient also had a fibroadenopapilloma of the stomach.

TABLE XVIII.—MYOFIBROMAS; AGE AND SEX INCIDENCE—12 CASES

Age	*Male*	*Female*	*Unstated*	*Total*
1– 9 years	—	—	—	—
10–19 years	—	—	—	—
20–29 years	1	3	—	4
30–39 years	2	—	—	2
40–49 years	1	2	—	3
50–59 years	—	—	—	—
60–69 years	—	—	—	—
70–79 years	1	—	—	1
Not given	—	1	1	2
Total	5	6	1	12

3. The incidence of symptoms and findings was as follows: pain in 9 cases, nausea and vomiting in 8, constipation and obstipation in 4, abdominal distention in 4, palpable mass in 5, diarrhea in 1 case, loss of weight in 2 cases, intestinal hemorrhage in 2, and anemia in 2.

4. Intestinal obstruction present in 8 cases.

5. No preoperative diagnosis of intestinal tumor was made.

6. Recovery from surgery ensued in 8 cases, death in 3, and the result of surgery was not stated in 1 report.

1. Fibroadenomas were operative findings in 12 cases. The tumor was not found at operation, but discovered later at autopsy in 1 case and was a primary autopsy finding in 2 instances.

2. Fibroadenomas were located in the duodenum in 4 cases, in the jejunum in 2, and in the ileum in 5; the exact site in the small bowel was unspecified in 4 cases. The tumors were intraluminal in 14 cases, and intraluminal and extraluminal in 1 case.

3. The incidence of symptoms and findings was as follows: pain in 10 cases, nausea and vomiting in 9, constipation and obstipation in 4, diarrhea in 2, palpable mass in 6, intestinal hemorrhage in 6, anemia in 3, emaciation and weight loss in 2, distention, tympanites, and meteorism in 2, and vertigo in 1 case.

4. Intestinal obstruction was present in 13 instances. Of 10 intussusceptions, 1 was double. Obstruction by tumor encroachment alone was reported in 3 cases.

5. No preoperative diagnosis of intestinal tumor was made.

6. Recovery from surgery ensued in 11 cases and death in 1 case.

1. Myofibromas were operative findings in 9 cases and primary autopsy findings in 2 cases. Circumstances of discovery were not stated in 1 instance.

2. Myofibromas were located in the duodenum in 1 case, in the jejunum in 3 cases, and in the ileum in 6; the exact site in the small intestine was not specified in 2 reports. The tumors were intraluminal in 8 cases and extraluminal in 4.

3. The incidence of symptoms and findings was as follows: pain in 7 cases, nausea and vomiting in 6, constipation and obstipation in 5, emaciation and weight loss in 2, palpable mass in 2, abdominal distention in 3, tension in the abdomen in 1 case, diarrhea in 1, and intestinal hemorrhage in 1.

4. Intestinal obstruction was present in 9 instances, and intussusception was present in 6. Obstruction was caused by encroachment and intussusception in 1 case, and by compression in 2 cases.

5. No preoperative diagnosis of intestinal tumor was made.

6. Recovery from surgery ensued in 9 cases.

1. Myxomas were operative findings in 6 cases and a primary autopsy finding in 1 case. The circumstances of discovery were not stated in 1 report.

2. Myxomas were located in the ileum in 4 cases and in the jejunum in 1 case; the exact site in the small bowel was unspecified in 3 cases. The tumors were intraluminal in 6 cases, extraluminal in 1 case, and unstated in 1.

3. The incidence of symptoms and findings was as follows: pain in 6 cases, nausea and vomiting in 7, constipation and obstipation in 5, palpable mass in 3, emaciation and weight loss in 1 case, dysuria in 1, intestinal hemorrhage in 2 cases, and abdominal distention in 3.

4. Intestinal obstruction was present in 7 instances. Intussusception was present in 6 cases, and obstruction was caused by compression in 1 case.

5. No preoperative diagnosis of intestinal tumor was made.

6. Recovery from surgery ensued in 5 cases and death in 1 case.

RETICULOFIBROMATOSIS

This extremely rare intestinal affection, considered benign, was reported by Laffargue, Bourgeon, and Eisenbeth in 1951. The case is briefly presented because no parallel one has been found in the literature.

Case. Female, 35 years old, suffered for 1 year from abdominal pain, vomiting, abdominal distention, and diarrhea. A mass was palpable. At operation an intussusception was reduced and a fibroid tumor was excised. The patient recovered from this operation, but 6 months later she returned because of subocclusion crises. A second operation was carried out and an ileoileal invagination was found. Three centimeters of intestine were resected. Some tumoral formations were found, which were both intramural and intraluminal. The patient recovered. The microscopic report was reticulofibromatosis.

TABLE XIX.—MYXOMAS; AGE AND SEX INCIDENCE —8 CASES

Age	*Male*	*Female*	*Total*
1– 9 years	1	—	1
10–19 years	1	1	2
20–29 years	—	—	—
30–39 years	—	1	1
40–49 years	2	1	3
50–59 years	—	—	—
60–69 years	—	1	1
Total	4	4	8

HEMANGIOPERICYTOMA

Hemangiopericytoma of the small intestine is another rare tumor. Smith and Swenson (1954) recorded the case of a female, 43 years old, who complained of a tumor in the lower abdomen, abdominal cramps, and gradual enlargement of the abdomen. There was occasional nausea and vomiting. During a routine examination a large pelvic tumor was discovered. The preoperative diagnosis was right ovarian cystoma. At operation a cystic mass, approximately 14 centimeters in diameter, was found attached to the antimesenteric portion of the ileum. The mass was enucleated; no bowel was resected. The outcome of the operation was not stated. The microscopic report was hemangiopericytoma.

TERATOMA

Tagliaferro in 1939 reported the case of a female, 49 years old, who had intense pains in the right lower abdominal quadrant, vomiting, and constipation. Three months later the pains were more severe and she had pollakiuria, dysuria, and pains down the right leg. On vaginal examination a mass was felt adherent to the crural arch. A diagnosis of adnexitis and chronic appendicitis was made. At operation there was found a tumor implanted on the free border of the terminal ileum which was yellowish in color, hard, and the size of a walnut; it was adherent to the corresponding area of the internal inguinal orifice. The loop of the small intestine was adherent

to the right round ligament and fundus uteri. Seven centimeters of small intestine were resected. The patient recovered.

On section the tumor had a marblelike appearance with alternate grayish and dark red zones. Histologically, it consisted of islands of osseous tissue in a fibrous stroma rich in vessels; fatty degeneration was evident. It was diagnosed as a teratoma.

BONY TUMORS

Three cases of tumors containing osseous elements have been reported.

Osteoma. Quenu reported the case of a female, 40 years old, who had abdominal pains and intestinal disturbances, vomiting, and diarrhea for 5 years. When the patient was admitted to the hospital she was in a state of marked emaciation. Operation revealed excessively distended loops of small intestine, but no adhesion or apparent tumor was found and the abdomen was closed. The symptoms recurred and a second operation was performed 5 months later. The intestinal loops were distended; toward the cecum the dilatation ended abruptly, whereas toward the duodenum it became thinner and ended gradually. The junction of the dilated and the normal intestine was explored carefully; there was a furrow, but palpation did not give any sensation of tumor, only the consistency of the tissue was thicker and the color whiter. About 25 centimeters of the intestine with the corresponding mesentery, which contained three or four lymph nodes, were resected. The patient recovered.

Section of the intestine revealed a hard, scirrhous stricture. There was a hard mass on the surface which was of osseous or calcareous structure and which obliterated the intestinal lumen, the latter already being narrowed by the thickening of the walls. The mass was fixed in the intestinal mucosa. The microscopic report was primary osteoma of the intestine.

Quenu mentioned that osseous plaques in the intestinal tract in animals had been reported by Wheatley in 1839, Smith in 1891, Drouin in 1894, and Petit in 1902.

Osteochondroma. A case of osteochondroma of the small intestine is included in the Mayo Clinic series and was first reported by Rankin and Newell in 1933. The patient was a female, 44 years old, who had a history of carcinoma of the body of the uterus, but she suffered no symptoms referable to the intestinal tumor. At operation the tumor was excised. The patient recovered. (Not included in our tabulation of 1,399 cases.)

Osteofibroma. Balteaux reported the case of a male, 34 years old, who entered the hospital with a diagnosis of abdominal tumor. The patient was emaciated and had pain, vomiting, and diarrhea. A movable mass was palpable. At operation a hard mass was found, analogous to bone, and adherent to the small intestine (not duodenum). The mass was attached to the free border of the intestine, encircling it for about a third of its circumference and for a length of 3 centimeters. The hard, osseous portion was enclosed in a fatty mass covered by a connective tissue covering, which resembled omentum. Decortication was done. The patient recovered. The histological report was osteofibroma.

PART II

MAYO CLINIC SERIES

In 1951 Olson, Dockerty and Gray reviewed the records of the Division of Surgical Pathology of the Mayo Clinic from 1911 through 1942 and found 77 tumors of the small bowel, of which 38 had given rise to clinical symptoms, and 39 were found incidentally at operation performed primarily for other conditions. No necropsy material was utilized (Table 20).

Intestinal obstruction was present in 36.8 per cent of all the types producing symptoms.

Bauer and Pratt reported the case of a female, 39 years of age, who was admitted September 2, 1945 with an intraluminal leiomyoma of the ileum causing intermittent intussusception.

Smith and Mayo in 1950 reviewed 67 cases of lipoma of the duodenum, jejunum, ileum, and Meckel's diverticulum from the Mayo Clinic surgical files through 1948 and from the autopsy files from 1922 through 1948. The findings were as follows:

Symptomatic	9
Autopsy findings	53
Incidentally found during operation for other gastrointestinal lesions	5
Total	67

Site of symptomatic lesions:

Duodenum	2
Jejunum	1
Ileum	5
Meckel's diverticulum	1

TABLE XX.—MAYO CLINIC SERIES

	Total		*Jejunum*	*Ileum*	*Duodenum*	*Uncertain*
		Symptomatic	2	3	6	
Adenomas	22	Nonsymptomatic	2	5	3	1
		Symptomatic	7	3	4	
Leiomyomas	22	Nonsymptomatic	3	0	5	
		Symptomatic	1	3	0	
Fibromas	11	Nonsymptomatic	3	4	0	
		Symptomatic	1	2	1	
Lipomas	7[a]	Nonsymptomatic	1	2	—	
Accessory		Symptomatic	—	—	1	
Pancreatic rests	6	Nonsymptomatic	—	1	4	
		Symptomatic	—	—	2	
Hemangiomas	4	Nonsymptomatic	1	1	—	
		Symptomatic	—	2[b]		
Miscellaneous	5	Nonsymptomatic	1[e]	1[c]		1[d]

(a) These may be included in Smith and Mayo's article, 1950.
(b) One case of cyst of the ileum in a female, 8 months; 1 case of hematoma in a female of 41 years.
(c) Cyst of the ileum in a male of 20 years.
(d) Osteochondroma in a female of 44 years.
(e) Lymphangioma in a male of 57 years.

Intussusception was present in 7 of the preceding cases, all except the 2 involving the duodenum.

Site of tumor found incidentally at operation:

Ileum	4
Jejunum	1

Site of tumors found at autopsy was not given.

Since Smith and Mayo's review on lipomas, Knight and Black (1951) published the case of a male, 55 years of age, who was admitted in 1949 and was operated upon for a duodenal lipoma.

Gentry, Dockerty, and Clagett in 1949 made an exhaustive survey of the literature from 1839 to 1945 and reviewed the case records from the Mayo Clinic files through June, 1945, tabulating each case in which a diagnosis had been made of either vascular malformation or a vascular tumor of the gastrointestinal tract. They found reports of 106 vascular lesions among 1,400,000 records. The vascular lesions of 46 patients were discovered at the time of surgery. In a further study of more than 10,000 records of autopsies from 1925 through 1944, 60 additional vascular tumors or vascular malformations of the gastrointestinal tract were found. According to their classification there occurred in the small intestine:

5	mixed capillary and cavernous hemangiomas
53	cavernous hemangiomas, multiple phlebectasia type (small cavernous)
10	cavernous hemangiomas, simple polypoid type
2	cavernous hemangiomas, diffuse expansive type (single contiguous)
2	hemangioendotheliomas
72	Total

The sites were as follows:

Esophagus and jejunum	1
Jejunum	14
Ileum	6
Small intestine and esophagus	3
Small intestine, esophagus, and colon	2
Small intestine, esophagus, colon, and stomach	1
Esophagus, ileum, and colon	1
Duodenum and small intestine	7
Duodenum, small intestine, and colon	1
Small intestine	26
Jejunum, ileum, and rectum	1
Jejunum and ileum	3
Stomach, duodenum, and small intestine	1
Small intestine, colon, and rectum	2
Duodenum	3
	72

In 1951 Butler, Tillisch, and Priestley reported from the Mayo Clinic a case of cavernous hemangioma of the jejunum in a male 27 years of age. Intestinal resection was performed and the patient recovered.

SUMMARY AND CONCLUSIONS

1. Exhaustive search of the literature revealed hundreds of original reports of benign small bowel tumors not taken into account in comprehensive reviews. Excluding the cases from the Mayo Clinic, which have been discussed separately, we collected records of 1,379 cases and added 20 new ones, all of which were detailed enough to allow both classification of the tumors as benign neoplasms of the small intestine and use of the clinical data for comparative study. The preceding discussions of incidences, clinical

behavior, diagnosis, and treatment of these unusual tumors were based upon study of the 1,399 case reports.

2. Benign tumors of the small bowel are unlikely to be encountered frequently by any one physician. In many cases the tumors are present for long periods before they come to clinical notice because of complicating intestinal obstruction or obvious intestinal bleeding. Because many of them are small and remain asymptomatic, they are encountered with greater frequency during autopsy than in surgical specimens. However, of the cases reported in detail, twice as many were found at operation as at autopsy.

3. Intussusception was noted as the most common type of obstruction, and benign tumors were shown to be the most common cause of this accident in adults. The inversion most often began in the ileum, the site of origin of almost half of the tumors. The association referred to was so frequent that various authors advised enterotomy and exploration of the lumen in each instance of reduction of an intussusception at operation if the bowel were still viable and to be left in place.

4. Bleeding into the lumen of the intestine was the second most common complication, and some form of this symptom was present in about 30 per cent of the cases. In two-thirds of the instances the bleeding was slight in degree and in one-third it was associated with intussusception. One-third of the patients who bled had serious or profuse hemorrhages, often recurrently. Twenty-three patients died of hemorrhage. Four-fifths of the severe hemorrhages and 21 of the deaths from this complication occurred in conjunction with tumors of connective tissue origin.

5. Many patients with these tumors suffered only from mild dyspepsias, with or without occult bleeding or intermittent melena. These symptoms were frequently mistaken for those of duodenal ulcer or of biliary disease. Later in the course of some of these cases intussusceptions were reduced, only to recur, patients with bleeding were hospitalized again and again without a correct diagnosis, and tumors sought for unsuccessfully at operation were found later at autopsy. In 79 instances the correct diagnosis was made preoperatively, each time by means of x-rays. (Among the 1,245 cases first tabulated the diagnosis of tumor of the small intestine was made only 43 times. However, there were 36 instances of this accuracy among the last 154 cases collected.) It has been suggested repeatedly that greater success in diagnosis might result from increased suspicion of the possible presence of small bowel tumors so that when routine gastrointestinal studies fail to reveal the cause for persistent mild dyspepsia and either occult bleeding or melena, the alerted roentgenologist can employ methods of examination directed specifically at the small intestine. Intestinal polyposis is so commonly present among individuals having familial melanin pigmentation of the lips and oral mucosa that the diagnosis can be made clinically when they are found to have intussusception or intestinal bleeding.

6. The treatment of preference is by excision with the procedures necessary to re-establish continuity of the intestinal tract. Especially when dealing with multiple tumors, thought must be given both to the possibility of associated malignancy and to conservation of an adequate length of small bowel.

7. Unless otherwise noted, each entry in the bibliography relates to an original case or cases abstracted by the authors. Entries are classified for convenience in the study of any one type of tumor. Cases in which duodenal intussusception occurred are marked with one dagger, multiple operations with two daggers, while one asterisk indicates the references to severe bleeding and two asterisks mark the reports of deaths from hemorrhage.

The invaluable assistance of Miss Alice Galskis in the preparation of this paper is gratefully acknowledged. She began research on the bibliography at the behest of the late Sam Brock, who participated actively in critical evaluation of the first group of case reports collected and in planning the tabulation of the data. She continued and completed the work after the authors became interested in the subject and had fortuitously learned of the existence of the incomplete bibliography.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Primary Reticulum Cell Sarcoma of the Mandible. ROGER G. GERRY and S. FRANCIS WILLIAMS. *Oral Surg.*, 1955, 8: 568.

PRIMARY reticulum cell sarcoma is a disease of the younger age groups (75 per cent under the age of forty) and may occur anywhere in the skeletal system but is rare in the bones of the head. The most common clinical manifestation is a painful destructive process of bone. The patient's general condition is usually good.

Coley, Higinbotham, and Groesbeck have reported a series of 58 cases of proved reticulum cell sarcoma. Thirty-seven patients had a primary focus when first seen or, if metastasis was present, a history of primary tumor for at least 6 months before admission. All were treated with radiation therapy alone or in combination with surgery, Coley's toxins, or both. This series represented 5 per cent of the bone tumors treated at Memorial Hospital in a 15 year period. The average age at the time of admission was 33 years and pain was present in all cases. Metastases were present in 48 per cent. There was a 5-year survival of 73 per cent and a 10-year survival of 55 per cent. Five-year survivals are not significant since recurrences have been noted 9 to 11 years after therapy.

The authors present 2 cases of primary reticulum cell sarcoma of the mandible. Only 6 cases have been published previously.

The first patient was a 22-year-old man who developed a painful swelling in the region of the right parotid gland in May, 1952. He was admitted to the hospital in April, 1953. Roentgenograms taken at that time revealed a bony tumor of the right mandible. The patient was treated with a total depth dose of 4,967 roentgen units over a 2-month period, and has been followed for 2 years without evidence of recurrence.

The second patient was a 19-year-old man who first noted a swelling below the mandibular incisor teeth 6 months prior to admission. He also noted that some of the lower teeth had become loose. Roentgenograms revealed a radiolucent area which extended from the lower left cuspid to the right first molar. The patient was treated with 4,083 roentgens depth radiation to the right side of the mandible. Because the tumor crossed the midline he also received 4,215 roentgens depth dose to the left side of the mandible. This patient was followed for one year without evidence of recurrence.

Most of the reported cases have been treated by wide excision or amputation and radiation therapy, or by radiation alone. The treatment of choice appears to be radiation alone in a depth dose of 3,000 to 4,000 roentgens in approximately 30 days. There is little evidence that surgery alone, or in combination with radiation, offers a greater chance for survival.

—*John H. Davis, M.D.*

EYE

Leiomyoma of the Iris; Report of a Case and Review of the Literature. WAYNE L. ERDBRINK and FRED HARBERT. *Arch. Ophth.*, Chic., 1955, 53: 643.

THE CASE of a 20 year old, white male with a salmon-colored 3 mm. nonpigmented tumor of the iris attracting four or five moderately sized blood vessels was reported.

A clinical diagnosis of leukosarcoma was made and after radioactive phosphorus studies, an excisional biopsy examination was made. Three expert ocular pathologists read the slide as leiomyoma of the iris.

In reviewing the literature, the author noted a patient of Verhoeff's who underwent three surgical excisions of an iris tumor and then exenteration. For 19 years the patient showed no untoward effects. Verhoeff then established the criteria for leiomyoma of the iris; (a) interlacing close bundles of spindle-shaped cells, (b) long oval nuclei in palisade formation, (c) granular eosinphilic cytoplasm of the cells, and (d) special staining to show myoglia fibrils.

Differential diagnosis must be made from leukosarcoma, implantation cyst, inflammatory granuloma due to syphilis or sarcoid, metastatic cancer, encysted foreign body, broad anterior peripheral synechiae, lymphosarcoma, and cancer of the pigment epithelium.

The author then presents a table with the 20 reported cases in the abstracted literature.

—*Albert C. Frell, M.D.*

Heredodegenerations and Heredoconstitutional Defects of the Retina. HERMAN ELWYN. *Arch. Ophth.*, Chic., 1955, 53: 619.

IT IS ASSUMED that heredodegeneration is based on faulty genes inadequately controlling the enzyme systems in certain cell tissues, allowing them to eventu-

ally die, or that genes governing the accumulation of the metabolites in cells are defective, allowing excess noneffective products to interfere with cell viability; these changes may occur early in life.

Heredoconstitutional changes occur as a result of lack of genes governing some cell functions, and such changes appear at birth.

Bruch's membrane, rod and cones, the inner nuclear layer, and the ganglion cells are affected by these changes, but the pigment epithelium is not affected primarily. As a result of degeneration of the cells, associated changes can occur, such as pigment proliferation or depigmentation, glial proliferation, hyalin and lipid deposits, and connective tissue proliferation.

Heredodegeneration of the elastic layer of Bruch's membrane includes disciform macular degeneration, angioid streaks, and certain cases reported by Sorsby and Mason. Disciform macular degeneration is the result of blood or plasma from the choriocapillaries in the posterior pole which passes through a break in Bruch's membrane and insinuates itself between the pigment epithelium and the rod and cone layer. Proliferation of the connective tissue, pigment epithelium, and glia form a mass in the posterior pole area. Also, lipid deposits, druesen, and hemorrhages may be present. Angioid streaks show degeneration of the elastic layer of Bruch's membrane, sometimes connective tissue proliferation centrally, and calcium deposits in the membrane. Often iron is also deposited. The cases of Sorsby and Mason presented a variation of the degeneration of the elastic layer. These cases were familial, started centrally, but progressed almost to the periphery of the retina. Here calcium and iron were not deposited. Heredodegeneration of the layer of rods and cones involves either the macular region in the periphery, or it results secondarily from choroid heterodegeneration.

In the macular region cones are lost and associated changes occur because of the pigment disturbance, as well as occasional druesen and glial proliferation. Usually these cases are bilateral, and their onset occurs at infancy, between the ages of 6 and 8 years, during puberty, or at senility. In peripheral retinal degeneration the condition of retinitis pigmentosa results; the rods and cones are lost, starting at the equator. The inheritance, as in macular degeneration, is of the dominant, recessive, or sex-linked type, and associated degeneration can occur in other tissues such as the brain. In choroid atrophy gyrate atrophy of the choroid and choroideremia occur, with secondary effects on the retina. In the first, the atrophy of the choroid progressively increases with loss of the overlying retina. In choroideremia, there is congenital absence of the choroid and outer layers of the retina, except centrally.

In heredoconstitutional defects, three conditions are considered: congenital night blindness, Oguchi's disease, and retinitis punctata albescens. The symptoms are present at birth, they do not progress, and they are due to defective genes governing the rods. In congenital night blindness, day vision is normal and the examination negative, except the electroretinogram which shows absence of a wave indicative of rod dysfunction. In Oguchi's disease there is a grayish discoloration of the fundus which persists only in daylight, and some rod function is present. The chief symptom is night blindness and it is recessive in inheritance. Retinitis punctata albescens also shows night blindness and is stationary. Daylight vision is normal, but there is no rod function. The examination shows punctate white deposits of unknown constitution.

Heredodegeneration of the inner nuclear layer and primary cystoid degeneration of the retina shows degeneration of the cells with fluid replacement. It occurs in the extreme periphery and in the macular region, and may form retinal holes. Retinitis circinata is due to cystoid degeneration. The macular region thickens and white deposits surround the central area, with some loss of macular vision.

Heredodegeneration of the ganglion cells involves an accumulation of a prelipid substance which the ganglion cells cannot use, and which affects the ganglion cells of the central nervous system as well. There are four diseases thus affected: infantile amaurotic family idiocy, juvenile amaurotic family idiocy, late infantile amaurotic family idiocy, and Nieman-Pick disease. In the first condition the retinal and the central nervous system ganglion cells are affected. The fundus shows retinal pallor centrally with a characteristic cherry red spot. Symptoms appear at 3 to 6 months and progress to death in 2 to 3 years. In the second, symptoms appear at 5 to 8 years and progress to death at 18 years, neurologic and cerebral changes occurring concurrently with the visual symptoms. In addition to the ganglion cell degeneration, the rods and cones degenerate. In the third, death usually occurs by 8 years of age and the condition is the same otherwise as the juvenile type. In the fourth type, in addition to ganglion cell changes, the reticular and endothelial cells show an accumulation of prelipin, and clinically there is a large liver and spleen and gradual deterioration. Death occurs in 2 to 3 years.

This very excellent article advances our knowledge of these diseases. —*Albert C. Frell, M.D.*

Ocular Effects Produced by High Intensity X-Radiation. PAUL A. CIBIS, WERNER K. NOELL, and BERTRAM EICHEL. *Arch. Ophth.*, Chic., 1955, 53: 651.

AN EXTENSIVE DETAILED EXPERIMENT was done using rabbits, guinea pigs, rhesus monkeys, and dogs, in which the results of high doses of x-rays to ocular tissues were noted.

Guinea pigs given a single dose to the eye showed vascular changes of edema and congestion of the conjunctiva, iris, and retina, the latter appearing only if the animal was pigmented and not an albino. Microscopic examination showed similar changes, plus cell necrosis, especially of the retinal rods.

Rabbits given whole head exposure showed blepharoconjunctivitis, iritis, and retinal, choroidal, and optic nerve changes. Rabbits given a single eye exposure showed minor changes of inflammation. Albino rabbits showed more pronounced similar changes, but pigmented rabbits showed subretinal exudation which appeared ophthalmoscopically in an orange-peel pattern.

Microscopically, results were classified as nonspecific inflammation and specific reactions of retinal structures. The first were chiefly inflammation and the second, necrosis of the retinal cells.

Monkeys showed complete rod cell destruction and variable damage to the cone cells. The retinal pigment epithelium was more resistant.

Summarizing, the author concluded that all tissues of the eye except the sclera were affected by high intensity x-rays and that the rods of the retina were most severely affected, and were killed by 1,700 to 2,000 roentgens. Cone cells survived 10,000 or fewer roentgens. A human eye exposed to 2,000 roentgens or more can be expected to show general congestion, hermorrhage, retinal detachment, rod cell death, and cone cell damage. If the dosage is very high, immediate blindness will result; if it is moderate there will be night blindness and tubular vision because of rod destruction.

This report should be read in detail by all, and it can then be intelligently correlated with previous reports and those to be subsequently presented.

—Albert C. Frell, M.D.

NECK

Paralysis of the Vocal Cords Following Thyroidectomy; a Study of Its Association with Hypothyroidism and Hypoparathyroidism. EUGENE J. RANKE and PAUL H. HOLINGER. *J. Am. M. Ass.*, 1955, 158: 543.

ONE HUNDRED patients with vocal cord paralysis following thyroidectomy were studied. In these patients, the frequency with which thyroid and parathyroid deficiencies occurred was found to be 31 and 16 per cent respectively. Hypothyroidism and hypoparathyroidism accompanied bilateral paralysis more than twice as often as unilateral cord paralysis. Hypoparathyroidism did not occur as an isolated complication in those patients having only one vocal cord paralyzed. Vocal cord paralysis occurred in a ratio of 9 females to 1 male, although the sex ratio of those patients requiring surgery of the thyroid gland is 4 females to 1 male. Glandular deficiencies occurred much more frequently in women than men. Thirty (33%) of the 90 women had some degree of hypothyroidism and/or hypoparathyroidism, compared with only 1 male out of the 10.

The authors then discuss the management of this complication. When a diagnosis of bilateral cord paralysis has been made, an immediate tracheotomy should be performed. Following the relief of the respiratory obstruction, studies should be carried out to determine whether thyroid and/or parathyroid deficiencies are present. Deterioration of the myocardium should be guarded against. When the patient is in a physiologically controlled state, the laryngeal airway should be made adequate for his requirements.

—Ely Elliott Lazarus, M.D.

Struma Lymphomatosa (Hashimoto's Disease). SAMUEL F. MARSHALL and WILLIAM A. MEISSNER. *Ann. Surg.*, 1955, 141: 737.

STRUMA LYMPHOMATOSA is a form of thyroid disease which has never been proved to be inflammatory but is usually classified in a group with other types of thyroiditis. The article deals with a study of the specimens of all cases of thyroiditis in which operation was performed at the Lahey Clinic, Boston; 114 cases of characteristic struma lymphomatosa were segregated.

The recognition of various forms of chronic thyroiditis as distinct entities is important to the clinician and surgeon, since it affects the therapy and prognosis of such forms of thyroid disease. The pathologic appearance includes changes in both the epithelium and the stroma. There is symmetrical enlargement of the gland grossly, with thin and nonadherent capsules. The gland is rubbery in consistency, rather than hard as is seen in carcinoma.

On microscopic examination, the follicles are diminished in size and lined with highly eosinophile epithelium; the colloid is scanty in amount. There is a variable degree of round cell infiltration with lymphocytes and plasma cells predominating. Many of the cases studied revealed varying amounts of fibrosis, but never as dense as in the conditions described by Riedel. The disease process was always present in all portions of the thyroid gland and possessed no relationship to hyperplasia, neoplasia, Riedel's struma, or subacute thyroiditis.

Clinically, the disease is more prominent in the fifth and sixth decades, occurs almost predominantly in females, and affects inhabitants of all social states and races. The most constant complaint was gradually progressive enlargement of the gland; fatigue, nervousness, and pressure symptoms were common. There was a tendency to gain weight, an increased basal metabolic rate, an elevated blood cholesterol level, and, occasionally, hoarseness and dysphagia.

The development of a firm goiter in the female past 40 years of age should make one think of Hashimoto's disease. The enlarged gland usually retains its normal shape, is moderately firm and rubbery, and elevates easily upon swallowing. There are no associated symptoms of pain, tenderness, or thyrotoxicosis. On the other hand, carcinoma appears as a hard and irregular enlargement, arises unilaterally and is often associated with enlarged nodes.

Surgery is usually indicated to determine whether or not carcinoma is present, to relieve pressure symptoms, and to achieve a good cosmetic result when the gland is enlarged. Since the thyroid involvement is bilateral in almost all cases, bilateral subtotal resection should be done. The operation should be radical enough to relieve tracheal compression; all of the patients so treated will develop signs of hypothyroidism. The gland is easily mobilized and there is a definite decrease in the vascularity of the gland. Total removal of the gland is unnecessary and undesirable. Roentgen ray therapy will produce additional fibrosis, increase constriction of the trachea, and further destroy the remaining secreting epithelium of the thyroid gland. ACTH will promote immediate relief of the symptoms in subacute thyroiditis but will not produce regression in the size of the gland.

—James H. Holman, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; Cranial Nerves

Fat Embolism of the Brain Following Severe Traumatism (Embolia adiposa cerebrale dopo gravi traumatismi). ANGELO ACQUATI. *Gior. ital. chir.*, 1955, 11: 181.

TWO INSTANCES of cerebral fat embolism, associated with head injuries and fracture of the lower extremity, are here reported. The clinical, roentgenological, and anatomopathologic findings were not unique; in fact, they were not essentially different from those of the 2 instances recorded by Swank and Dugger (SURG. GYN. OBST., 1954, 98: 641); however, the extreme rarity of these conditions and the extreme difficulty in arriving at a purely clinical diagnosis would seem to demand that each case history be given more or less in extenso, particularly if there has been an autopsy. More especially does this seem to be true since a nosologic picture, reliably distinguishing between the cerebral symptoms of cerebral fat embolism and those incident to the accompanying head injury, is yet to be constructed.

The first patient, a 35 year old male, arrived at the hospital as an emergency. His mind was clear; he was able to remember the incidents appertaining to the accident. Examination disclosed a comminuted fracture of the middle third of the left femur and a hematoma of the scalp over the left temporal region. This lucid interval persisted for 2 days; then there developed an aphasia, intense and progressive agitation, and eventually coma. The pupils were now somewhat dilated and unresponsive to light; the corneal reflexes were preserved, but weakened; there was a status of contracture of the upper and lower extremities with a clonic type of Babinsky sign and increased tendon reflexes on the right side. Urinary incontinence was present. Three days later the patient died.

Histologic examination with Sudan III—hematoxylin disclosed the presence of fat emboli in large numbers of capillaries in the white substance of the brain; however, the gray matter and the brain stem were spared. The occluded blood vessels marked the locations of the perivascular petechiae observed macroscopically. There were areas of softening and necrotic changes of the cerebral tissue, irregularly distributed and without marked evidence of edema.

The second patient, a 15 year old male, was received at the hospital in a state of shock from an automobile accident. He was conscious but stated that he had suffered a period of mental confusion at the time of the accident. Examination disclosed comminuted fractures of the middle third of both the femur and tibia on the left side. This lucid interval persisted for 20 hours; then the patient became agitated and passed into a comatous state. The pupils became dilated and reacted poorly to light. The osteotendinous reflexes were increased and frequent crises of tonicoclonic generalized convulsions developed. Between these attacks the patient experienced periods of complete muscular relaxation and hypotonia. Urinary incontinence was present. Spinal fluid pressure was somewhat increased. These symptoms increased progressively in severity, and the patient died 30 hours after the time of the accident.

Histologic examination of the brain with Sudan III stain disclosed the same capillary and precapillary occlusions by means of fat emboli. In this patient, however, there was also a marked generalized edema of the brain, and the petechiae and vascular occlusions were present in the gray matter and in the brain stem.

Thus, it would seem that the elective staining for fat globules in the capillaries of the brain would be the only means of distinguishing between fat embolism and craniocerebral trauma; however, the author believes that the presence of cerebral fat embolism would be more frequently suspected if the lucid interval in this last-mentioned nosologic entity and the concomitant presence of cranial trauma and the fracture of a long bone would be kept in mind in these cases. —*John W. Brennan, M.D.*

A Case of Cerebral Coenurosis (A propos d'un cas de cénurose cérébrale). J. DUPLAY, MAGDELEINE BÉRARD-BADIER, P. COSSA, and J. RANQUE. *Presse méd.*, 1955, 63: 625.

EIGHT CASES of cerebral coenurosis have been reported since 1913 and the authors thought that this case was also worth describing. The tapeworm occurs in the small intestine of dogs and the intermediate stage is known as Taenia multiceps, occurring in the brain of sheep, cattle, and goats.

The patient, a 42 year old farmer and former shepherd was seen in October, 1953 because of headache and personality disturbance. He became progressively more disoriented in time and space and was hospitalized. Papilledema was the only unequivocal neurologic finding. The electroencephalogram showed marked slowing in the left frontal region. Blood studies revealed only a moderate leucocytosis of 10,000. A left angiogram was negative; however, ventriculography showed a large bilateral hydrocephalus which was symmetrical. Air was injected from below but was obstructed at the base. A left frontal craniotomy was performed. An adhesive arachnoiditis was found in the region of the chiasm. The whole region was dotted with small vescicles 5 mm. in diameter resembling small grapes. The patient died a few days later and the autopsy findings are given in some detail with supporting color illustrations.

The article closes with a brief mention of similar cases and an appropriate bibliography.

—*Adrien Ver Brugghen, M.D.*

Treatment of Temporal Lobe Epilepsy by Temporal Lobectomy; a Survey of Findings and Results. MURRAY A. FALCONER, DENIS HILL, ALFRED MEYER, WILLIAM MITCHELL, and DESMOND A. POND. *Lancet*, Lond., 1955, 1: 827.

THERE has been a great deal of writing and discussion of temporal lobe epilepsy in the past few years, especially in the United States and Canada. It is therefore

of interest to note the results of a team of investigators from the British Isles. The report concerns 30 patients with intractable temporal lobe epilepsy, of which 12 became fit-free and 14 were markedly improved as regards their epilepsy. Twenty were benefited as to their personality problems, 17 markedly so.

The historic background of this condition is discussed with reference to the fundamental contributions of various workers in the field. Special reference is, of course, made to the dean of investigators in this field, Wilder Penfield. Of the 30 patients whose cases form the basis of this paper, 23 came from the epileptic practice of a psychiatric hospital, and the rest from a general hospital. The seizures were those usually recognized as temporal lobe epilepsy and these are described; the personality changes were variable, some patients exhibiting aggressive impulsive behaviour, some with paranoid trends, and others with hysterical anxiety and depressive features. All had been under medical care for long periods and on anticonvulsant therapy. Neurologic examination and spinal fluid were considered normal in all except two patients who had sustained severe closed head injuries, and one patient who had an infantile hemiplegia.

Electroencephalographic studies included the usual array of electrodes plus sphenoidal and midline basal leads. Induced narcosis was employed and epileptic discharges often became activated as the patient passed into sleep. Twenty-eight of the 30 showed spike or sharp-wave discharging foci in the temporal regions; in 19 this was confined to one side, and in 9 the discharges were bilateral but predominated on one side. The radiologic studies of the skull were usually normal but one-quarter showed disproportion between the sides of the cranial cavity, which indicated a developmental defect. Pneumoencephalography was carried out in all, and in some slight assymetry was noted. Gross distortions of the ventricular system were seen in some patients, due to space-occupying lesions, and these were excluded from the series.

The operative procedure is briefly described and, in general, consisted of removal of 6 to 7 cm. of the temporal lobe including Ammon's horn, the medial part of the uncus, and the fimbria hippocampi. Bilateral temporal lobectomy was only resorted to in one patient who died 6 months later in status epilepticus without exhibiting any sexual derangements. Electrocorticography was helpful in some, but was not considered essential when the other electroencephalographic studies had been adequate. One other patient died 8 months after operation in status epilepticus. Most patients showed a partial to complete homonymous hemianopsia and those in whom the procedure was confined to the dominant hemisphere showed some hesitancy of speech in one-third of the cases.

The over-all results are tabulated.

The pathologic findings were significant in that some change was found in every resected temporal lobe. Nine had macroscopic lesions, 3 had cerebral tumors, 2 had hemangioma calcificans, 2 had angiomas, 1 had infarct, and 1 cicatrix. In the remaining 21 cases microscopic lesions were found; these have been described in another paper by one of the authors.

The best results were obtained in 13 cases in which the discharges were strictly confined to one temporal lobe. Twenty-six patients were benefited as far as their epilepsy was concerned and 20 of the 29 were improved with regard to their personality disorder. The authors believe that we are on the threshold of wide expansion in this field and that further improvements will result, with solid establishment of the criteria used in proposing resection.

—*Adrien VerBrugghen, M.D.*

Recent Advances in the Surgical Management of Chromophobe Tumor of the Pituitary. ELISHA S. GURDJIAN, JOHN E. WEBSTER, FREDERICK R. LATIMER, SANDER P. KLEIN, and JAMES E. LOFSTROM. *J. Am. M. Ass.*, 1955, 158: 23.

ATTENTION is drawn to the use of newer and more complete information on the endocrine glands, especially as it applies to postoperative stress. By this means the operative mortality rate has been reduced to 5.5 per cent in the last 18 patients.

The article deals with 38 patients operated upon in the last 18 years. The well known symptoms and signs of pituitary tumor with hypofunction of the gland are described. Visual field findings are illustrated. In some cases pneumoencephalography was used and in others angiography. A characteristic bowing of the anterior cerebral artery was seen. The usual operative findings are discussed; in some cases operation was followed by x-ray therapy, depending mainly on the cystic or solid nature of the tumor.

The endocrine discussion has to do with the well known stress syndrome and the fact that a hypofunctioning pituitary gland does not stimulate the production of sufficient adrenocorticotrophic hormone to withstand the stress of an intracranial operation. The pituitary hormones are estimated by testing the functions of their target organs. The basal metabolic rate, protein-bound iodine, radioactive iodine, and serum cholesterol studies will indicate thyroid function. Measurement of the urinary 17-ketosteroids, 11 oxyketosteroids and serum electrolytes, the glucose tolerance test, and the Kepler water test will indicate pituitary ACTH function. Preoperatively the patient is given corticotropin to stimulate the adrenal gland and if this does not produce an adequate response recourse must be had to cortisone or hydrocortisone. Testosterone is often of help and if there is thyroid deficiency this should be corrected. After operation there should be appropriate replacement therapy.

—*Adrien Ver Brugghen, M.D.*

PERIPHERAL NERVES

Evaluation of Nerve Damage After Intramuscular Injections (Ueber die Beurteilung von Nervenschaeden nach intramuskulaeren Injektionen). W. FUHRMANN and G. GRUENWALDT. *Chirurg*, 1955, 26: 210.

THE AUTHORS discuss a series of 13 cases in which severe damage of the ischiadic, peroneus, or tibialis nerves occurred after intramuscular injections in the gluteal region. Five of the patients received injections of sulfonamides; three of these were children. In all cases pains in the area of the ischiadic nerve were registered during the injection. The paresis of the peroneus and/or tibialis or the entire motor portion of the ischiadic nerve set in after an interval of from one-

half hour to 8 weeks after the injection. The prognosis was quite poor in all cases. Once the paralysis had developed it was permanent, and hardly any restoration of function was noted even after years (observation time up to 6 years). In small children severe paralytic club foot and retardation of growth of the extremity developed in some cases.

The authors discuss the pathogenesis of these severe injuries. Several theories have been offered: abnormal course of the ischiadic nerve, or secondary degeneration of the nerve caused by strangulation by scar tissue which developed at the site of injection. Another possibility is that the drug may have reached the nerve by "diffusion" along the muscle sheaths or the pelvic bone wall, or the tissues between the injection site and the nerve may have been destroyed by the drug.

The writers of this article as well as other workers studied the effect of perineural injections on the nerve tissue in animal experiments. They found severe necroses and destruction of nerve fibers even when the injection was not given intraneurally but in the surrounding tissue. However, no evidence was found that dispersion or "diffusion" of the drug to the nerve occurs when the injection is given correctly in the outer upper quadrant of the gluteus muscle.

To study the question of dispersion in the muscle, injections of 1 c.c. of iodipin and of bismogenol were made in the gluteus muscles of 6 rabbits, and roentgenograms were taken at short intervals. During the first 30 to 40 minutes no appreciable distribution in the muscle was found; however, after 3 to 4 hours wide and irregular dispersion was observed, presumably along muscle sheaths or gaps between the muscles.

Although the question of dispersion in the muscle requires still further study it is the consensus of the great majority of workers that nerve damage is possible only when faulty technique is used. The authors emphasize the importance of meticulous observation of technique. The injection should be given two finger breadths below the iliac crest in the middle axillary line. The needle should point in the direction of the iliac crest, and the drug should then be injected slowly and under low pressure.

—*Werner M. Solmitz, M.D*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Cancer of the Breast in Sydney Teaching Hospitals. W. J. PULLEN, J. W. SPENCE, ALAN SHARP, J. P. FLEMING, and V. H. CUMBERLAND. *Austral. N. Zealand J. Surg.*, 1955, 24: 251.

THE REPORT of these authors consists of a statistical analysis of a series of 1,432 patients with cancer of the breast, who were treated in four teaching hospitals of Sydney, Australia during the years from 1936 to 1948 inclusive. The hospitals concerned are the Royal Prince Alfred Hospital, the Sydney Hospital, St. Vincent's Hospital, and the Royal North Shore Hospital.

The authors cite Lancaster (1951) to show that carcinoma of the breast accounts for 20 per cent of all cancer in women in Australia, and that a little more than 2 per cent of all females will die of cancer of the breast. Of the total number of patients, 173 were untraced, leaving a total of 1,259 traced patients. These were divided chronologically into three groups: 1936 to 1940, 1941 to 1944, and 1945 to 1948.

The age of the patient at the onset of the disease, with the exception that the 10-year survival rates of younger patients were higher, did not seem to be a factor influencing 5 and 10-year survival rates. With respect to the length of history or the time elapsing prior to treatment, from 1 month to 6 months did not appear to influence the survival rates, but in the cases of patients with the history of a lesion from 6 months up to 2 years prior to treatment, the survival rates were lower, but not appreciably so. Likewise, the site of the tumor within the breast did not appear to influence the survival rates. The influence of histologic type was investigated, and the survival rates of patients with the scirrhous and encephaloid carcinomas were somewhat lower than for those with adenocarcinoma, mucoid, and intraductal types of lesions.

The authors also analyze the effects of preliminary biopsy. In most instances the biopsy consisted of excision of the whole lesion. These figures were investigated with respect to stages I and II, which are the earlier lesions. Stages III and IV, the more advanced lesions, were not included at this point. Survival time in stage I, with biopsy, was 7.8 years. The survival time of patients in stage I, without biopsy, was 6.5 years; in stage II, with biopsy, 4.8 years; in stage II, without biopsy, 3.8 years. It appeared that preliminary biopsy did not unfavorably influence the outcome.

With respect to treatment, radical mastectomy with or without radiotherapy was preferred when it was possible to eliminate the disease entirely, i.e., in stages I and II. Other forms of treatment were reserved largely for patients who were considered to be beyond the stage of curative surgery, patients with general systemic disease, or for those of advanced age.

The operative mortality following radical mastectomy was 2.3 per cent, and did not appreciably change throughout the entire period of the survey.

The survival rates are as follows: 60 per cent of patients in stage I who were treated by surgery alone survived 5 years, 43 per cent survived 10 years; survivals of patients in stage I who were treated by a combination of surgery and radiotherapy were as follows: 5 years, 75 per cent; 10 years, 44 per cent. Survivals of patients in stage II were as follows: 29 per cent with surgery alone and 39 per cent with surgery and irradiation survived 5 years; 11 per cent with surgery alone, and 10 per cent with surgery and irradiation survived 10 years. It appeared, then, that with deep x-ray therapy following radical mastectomy, the 5-year survival rate was increased 15 per cent among patients with cancer of the breast in stage I, and 10 per cent in Stage II, but little change was noted in the 10 year survival rate. (It might be noted at this point that stage I was defined as growth confined to breast with no involvement of axillary lymph nodes, whereas in stage II the growth was confined to the breast, but axillary lymph nodes were involved; in stage III there was infiltration of the skin or muscles with or without involvement of the axillary lymph nodes; and in stage IV, remote metastases were present.

The authors compared their series with a series of untreated patients (Greenwood) and found that treatment apparently plays little part in increasing the total survival rate during the first 2 years, but following that period treatment improves the prospects of survival by approximately 10 to 15 per cent.

Included in the authors' summary is a statement that radiotherapy following radical mastectomy increases the survival rate in stages I and II by 10 to 15 per cent, but has little effect on the 10-year survival rate. —*John H. Schneewind, M.D.*

Radical Excision of Malignant Chest Wall Tumors. J. MURRAY BEARDSLEY and CHARLES R. CAVANAGH, JR. *J. Thorac. Surg.*, 1955, 29: 582.

RADICAL EXCISION of the chest wall for primary and secondary malignancies is recommended as a curative procedure. Ten cases are presented and the article is illustrated with preoperative, postoperative, and operative pictures. The authors present a method whereby the defect created can be closed, with resulting satisfactory stability of the chest wall.

At first, tantalum plates were used but these were poorly tolerated. Tantalum mesh was finally decided upon and was fixed to the defect by over-lapping, not by tailoring to the defect. This was found to eliminate tearing of the mesh at the prosthetic-tissue junction. No great difficulty was experienced in obtaining adequate cutaneous coverage for the prosthesis. At times it was necessary to mobilize the opposite breast to obtain coverage. The authors stress that the operation should be done for cure and not palliation. The case reports consisted of carcinoma of the lung with thoracic cage invasion, several local recurrences of breast cancer, rhabdomyosarcoma, and osteogenic sarcoma.

The results have been gratifying. There were 6 cases of recurrent breast neoplasm in the series. One patient is alive 4 years after operation, another has no evidence of recurrence 10 months after operation, and

a third patient died of concurrent causes with no evidence of tumor at autopsy. Recurrence is evident in 1 patient at 3 years. The patient with the osteogenic sarcoma is alive 7 years after resection; the patient with epidermoid carcinoma of the lung with chest wall invasion is a 6-year survival. In this series of 10 cases there was one operative mortality which the authors feel was preventable.

—*Richard L. Lawton, M.D.*

TRACHEA, LUNGS, AND PLEURA

Acute Lung Abscess; with Emphasis on the Medical Aspects. S. AUBREY GITTENS and JOHN P. MIHALY. *Am. J. Surg.*, 1955, 89: 986.

LUNG ABSCESS is a localized area of suppuration in lung tissue, with or without cavitation and accompanied by various degrees of necrosis. Pulmonary gangrene is a massive fulminating abscess, differing from the former in degree but not in kind. While time is the most convenient factor in distinguishing acute from chronic abscess, the dividing line is hazy. Usually, a duration of less than 6 weeks earmarks the abscess as acute. A subacute abscess is one which has been present 7 to 12 weeks, and a duration of greater than 12 weeks is accepted usually as evidence of chronicity. Judgment must be based on the total clinical and radiologic picture and should be very critical since an abscess with chronic features cannot be cured medically.

Lung abscess is a lesion caused by one or several species of pyogenic bacteria. Extraordinary fungous, acid-fast, and parasitic infections constitute a special category. Bacterial abscesses become complicated by secondary invaders and a large variety of organisms can be recovered from the sputum by bacteriologic techniques.

When the infection is caused predominantly by anaerobic organisms, putrefactive necrosis occurs and produces a foul-smelling sputum. Lung abscess is definitely decreasing in incidence since early treatment by various antibiotics.

The following modes of pathogenic evolution are recognized in the approximate order of frequency: aspirational-inhalational, neoplastic, postpneumonic, traumatic, direct extension from adjacent organs, septic embolism, and miscellaneous.

The complications may be divided into those caused by rampage of the abscess and those arising as a result of ineffective healing. In the former group are (1) spillage of infectious material through the bronchial tree giving rise to secondary abscesses in ipsilateral or contralateral lung; (2) rupture of abscess into the interlobar fissure or pleural cavity, causing localized or generalized empyema; (3) rupture into both bronchial tree and pleural space, causing bronchopleural fistula and pneumothorax; (4) erosion of blood vessels, especially bronchial arteries, causing hemorrhage; and (5) metastatic implantation of infectious material into other organs, particularly the brain.

In the second category are (1) lapse of an acute abscess into chronicity; (2) residual bronchiectasis remaining as a focus for future suppuration; and (3) extensive fibrosis, resulting in pulmonary fibrosis and emphysema causing a defective pulmonary circulation and ventilatory crippling. Medical management in most of the foregoing complicating features of lung abscess should be confined only to optimal preparation for adequate surgery.

Before the advent of antibiotics medical management was largely palliative since in 40 to 60 per cent of cases the process passed into chronicity, became complicated, and a surgical problem. Volatile oil inhalations, vaccines, alcohol intravenously, and x-ray therapy were tried, but proved to be of questionable value. Arsenicals were given where spirochetes were recovered, and potassium iodide when fungi were demonstrated. Recovery was obtained with such measures alone in a substantial number of cases, yet as high as 35 per cent terminated fatally while apparently recovering. Lung abscess was therefore considered a surgical disease from the onset, external drainage being the treatment of choice as resectional surgery had not yet been established. The pendulum is swinging to the belief that acute uncomplicated lung abscess is primarily a medical disease.

The sulfonamides, particularly sulfadiazine, altered the therapeutic approach somewhat, but because of their relatively narrow antimicrobial spectrum they produced no outstanding results. The authors favor penicillin injections and reserve the streptomycins, chloromycetin, and the tetracycline derivatives for those who do not respond to penicillin adequately and for complications. Tryptar, aerosol by nebulizer, or aerosol mask may liquefy tenacious sputum. Adequate diet, vitamins, iron, protein supplements, and blood transfusions are administered as required.

Marginal minor procedures used are chest taps, pneumothorax, enzymatic débridement, and topical treatment. In resectional surgery it is imperative that resection should remove the diseased area completely with minimal sacrifice of healthy lung tissue. Pneumonectomy is rarely indicated for lung abscess and is reserved for cases with fairly good evidence that the process is neoplastic; in cases with extensive fibrosis, mediastinal shifting and defective cardiovascular dynamics.

It is the opinion of the authors that acute uncomplicated lung abscess is a medical problem and that the role of surgery in chronic cases and early cases with complications should be recognized; that the number of cases requiring surgery will become increasingly smaller if prompt and adequate antibiotic, nutritional, and ancillary medical measures are instituted early. No single antibiotic or combination thereof appeared to be distinctly superior to the others. Successful treatment depends on promptness and adequacy. —*John H. Mohardt, M.D.*

Lung Abscess—a Medicosurgical Problem. DAVID H. WATERMAN, SHELDON E. DOMM, and WILLIAM K. ROGERS. *Am. J. Surg.*, 1955, 89: 995.

THE AUTHORS stress that in spite of wide-spectrum antibiotics, lung abscess is commonly observed, that medical treatment alone does not suffice, and that resection alone is not the only surgical procedure to be considered.

Regarding the first of these, it is to be noted that the etiologic factors producing lung abscess, such as

dental sepsis, aspiration of vomitus or other infective material, and various types of bronchial block have not been eliminated by antibiotics.

Earlier treatment of the resulting pulmonary infections with the antibiotics and early bronchoscopy have reduced the incidence of lung abscess. During the past two years the authors have treated 50 cases and figures from other thoracic clinics show that the problem has not been eliminated. Since the advent of wide-spectrum antibiotics the results have been improved compared to the complicated clinical picture prior thereto, when a combined collective series of 4,280 cases showed over 34 per cent mortality.

In 1952 the authors analyzed 218 cases of lung abscess and suppurative pneumonia, treated personally. Of these, 134 cases were treated conservatively, with the use of bronchoscopy and antibiotics. Good results were obtained in 77 per cent of the 74 patients seen in the postantibiotic era, in contrast to 63.3 per cent of 60 cases seen in the preantibiotic era. There was a marked drop in mortality—from 23.3 per cent in the preantibiotic era to 4 per cent in the postantibiotic era. While the mortality has been markedly reduced, the authors observed an increase in the number of cases treated surgically, since antibiotics obscure the symptoms and diagnosis, allowing more abscesses to progress to the chronic stage.

The indications for open drainage in patients with chronic abscess are markedly narrowed by the efficacy of conservative therapy and the improved mortality following resection which, in published figures, has been reported as low as 3.8 per cent in 52 cases. Surgical drainage of suppuration remains a valid principle and is applicable in bad risk patients.

Indications for open drainage are: (1) the presence of an acute fulminating abscess that fails to respond to bronchoscopy and antibiotics; (2) patients who are too ill and too old; and (3) the solitary uncomplicated acute abscess peripherally located.

Resection therapy is applicable to chronic complicated abscesses. Of the authors' 52 resections since the advent of antibiotics, the mortality has been 1.9 per cent. In the preantibiotic era it was 28.6 per cent. Conservation of lung tissue is important, and lobectomy and segmental resection are superior to pneumonectomy. The incidence of empyema in pneumonectomy remains too high.

Bronchogenic carcinoma is an increasingly common cause of lung abscess and should be considered as the etiologic agent until proved otherwise. Forty per cent of a total of 464 cases were malignant.

On the basis of the authors' experience with 268 cases of lung abscess and suppurative pneumonia of nonmalignant etiology, a regimen of medicosurgical management is outlined.

—John H. Mohardt, M.D.

Cystic Disease of the Lung; with Emphasis on Emphysematous Blebs and Bullae. JEROME R. HEAD. *Am. J. Surg.*, 1955, 89: 1019.

PULMONARY CYSTS are congenital epithelium-lined cavities variously defined as simple cysts, batrachian cysts, and bronchiectatic cysts. Simple cysts are solitary cysts with no communication with the air passages and they contain fluid or air, or both. They are symptomless unless infection sets in or hemoptysis is produced. Batrachian cysts are cysts involving lobar segments, with patent bronchi and branches for the ingress and egress of air. These cysts grow rapidly after birth and may fill an entire hemithorax with compression of the normal lung. Bronchiectatic or congenital cysts of the lung are associated with maldevelopment of the bronchial respiratory system. Emphysematous blebs are air-filled blisters covered by visceral pleura caused by alveolar rupture into the subpleural space. Depending on the ball valve mechanism, air is entrapped and single or multiple giant blebs may develop which are either apical or basal. It is reported that blebs may predispose to bronchiogenic carcinoma. Extreme lobar emphysema in children involves the dilatation of a single lobe with displacement of the mediastinum. It is believed to be caused by a ball valve obstruction of the lobar bronchus although clinically no such obstruction is demonstrable. Emphysematous bullae are air sacs within the lung parenchyma produced by the breakdown of interalveolar septa and caused by severe vesicular emphysema. Vesicular emphysema is an alveolar dilatation resulting from a loss of pulmonary elasticity and creating a space-occupying lesion limiting the maximum function of the normal lung.

The author believes that ball valve action per se does not account for the extreme dilatation observed clinically in several varieties of emphysema. In obstructive emphysema, dilatation is obtained to the point of maximum inspiration. Dilatation beyond this point involves other mechanisms whereby air is further forced into the involved lung during expiration. This is possible through the collateral channels between segments and lobules, forcing air into the obstructed portions of the lung. Segmental or lobular bronchial obstruction does not cause distal atelectasis, as is commonly believed, but is indicative of infection following the interference of normal secretory drainage. If obstruction is complete before the onset of infection, the obstructed lung area becomes emphysematous. Cough and other strong expiratory efforts can force air through intersegmental channels to maximally dilate lobules beyond any possible inspiratory effort.

Giant balloon cysts and giant emphysematous lobes do not necessarily increase in size because of pressure developed within them by ball valve occlusion. Under the forces of respiration an elastic portion of lung can stretch and dilate progressively. Pressure within these distended cysts is plus and minus zero and the ingress and egress of air is free.

—B. G. P. Shafiroff, M.D.

Peripheral Bronchial Adenoma of Mucous Gland Type; Clinical and Pathologic Aspects. MORRIS A. WEINBERGER, SOL KATZ, and EDGAR W. DAVIS. *J. Thorac. Surg.*, 1955, 29: 626.

TWO MAJOR theories concerning the origin of bronchial adenoma are presented. The authors cite a case which substantiates the origin of adenoma from bronchial mucous epithelium. This introduces a third variant of bronchial adenoma (mucous gland type) and certain conclusions concerning the mitotic activity of the lesion and its surgical removal.

Womack and Graham hold to the thesis that bronchial adenomas are mixed tumors of anlagen origin. A second theory suggests that bronchial adenomas arise from the bronchial mucous glands or ducts. Indirect evidence has been presented to substantiate this thesis—e.g., their location near bronchial epithelium; they do not develop in relation to small bronchioles where mucous glands are absent; the finding of "transitional cells;" and the presence of mucus either intracellular or extracellular.

The authors present a bronchial adenoma which clearly resembled mucous epithelium and was partially endobronchial. A case reported by Ramsey and Reiman is compared. The latter tumor was of the same histologic pattern, but was more centrally located in the lung parenchyma. The difference in the two cases clinically can be explained on the basis of location. The radiographic appearance of this lesion was that of a "solitary intrapulmonary tumor." Exploratory thoracotomy is recommended in most instances. The incidence of bronchial adenoma in solitary lung lesions is 8 per cent.

Bronchial adenomas have been classified into carcinoid and cylindroid groups. This classification is reminiscent of neoplasms in other organic systems. Several variants of these two groups have been proposed.

There has been much controversy concerning the benignancy or malignancy of bronchial adenomas. Womack and Graham regard them as potentially malignant. Moersch and McDonald state that the carcinoid type accounts for 90 per cent of adenomas and that the remaining 10 per cent is composed of cylindromas. There is a tendency to consider the cylindromas more malignant. The incidence of metastases is thought to be about 10 per cent. Of 87 cases of metastasizing adenoma gathered by McBurney, 46 showed regional node metastases. In the other cases the lesion metastasized to remote organs.

The authors are of the opinion that many cases of metastasizing adenoma are poorly documented.

In the 2 cases alluded to by the authors, a surgical procedure designed to locally remove the tumor seems adequate. They intimate that the variant of bronchial adenoma which they describe (mucous gland type) is essentially a benign tumor.

—*Richard L. Lawton, M.D.*

Bronchial Carcinoma; Survey of 317 Patients. J. R. BIGNALL. *Lancet*, Lond., 1955, 1: 786.

THE AUTHOR reports the results of a survey of 317 hospital patients with bronchial carcinoma who were seen in 1951.

There was histologic confirmation of the diagnosis in 199 cases (62 per cent). A high proportion of the patients were between 50 and 60 years of age. Compared with all patients having lung cancer, this series contained fewer with undifferentiated tumors as well as fewer women and old people.

A fifth of the patients had had symptoms or signs for less than 2 months, but half of the patients had them for more than 4 months, and one-tenth of the patients had symptoms for more than a year. Almost a third of the patients had evidence of metastases when first examined.

In 75 per cent of the cases, thoracotomy was not done because of evident intrathoracic or extrathoracic spread. In the 25 per cent of patients who had thoracotomy, removal of the tumor was not possible in a third. A third of the patients received radiotherapy alone.

Forty per cent had died in 6 months, 67 per cent were dead in 1 year, and 84 per cent in 2 years. Of the 77 survivors, 31 had had a resection. Many patients who died had manifest cerebral metastases.

—*S. Lloyd Teitelman, M.D.*

HEART AND PERICARDIUM

Subvalvular Mitral Stenosis—Its Recognition and Treatment. HENRY T. NICHOLS and WILLIAM L. JAMISON. *J. Thorac. Surg.*, 1955, 29: 611.

IN THE COURSE of the development of valvulotomy for mitral stenosis, abnormalities of the chordopapillary system have been encountered. The fusion of papillary muscles and/or chordae tendinae may give rise to various types of subvalvular stenoses. The recognition of these abnormalities has led to a specific type of operative approach in each.

Type I subvalvular stenosis is characterized by a cross fusion of the chordae tendinae. In this type finger dissection of the fused chordae is used. The finger pressure is generally applied downward toward the ventricle

Type II stenosis is characterized by chordopapillary fusion and shortening of the chordae. For this type of stenosis the author has devised a special guillotine knife. This deviates from the standard knife in that the lower end is blunt and probe-like. The probe-like portion protrudes beyond the knife when it is closed. The probe-end can be used to feel the way between valve leaflets and the papillary muscle. After the knife is engaged, the commissure is cut. Frequently the fusion can be further split by the finger after the initial cut. If continued cutting of the valve fusion is necessary, it is done with multiple small cuts to avoid cutting into the leaflet. After commissural disruption, additional widening of the orifice may be obtained by splitting the papillary muscles with digital pressure.

Type III stenosis is represented by a marked shortening of the chordae with papillary-leaflet fusion. No chordae can be identified with the palpating finger. To deal with this abnormality, the authors have devised a knife called a papillotome. This instrument has a golf-stick like terminal angle with a lancet point at the tip. The lancet is engaged in the papillary muscle and the guillotine blade is activated, cutting commissure and papillary muscle in turn. The division of the papillary muscle can be completed with digital pressure.

The recognition of types of subvalvular stenosis has been aided by the bare-finger technique. Awareness of subvalvular stenosis is important if severance of the underlying chordae and papillary muscles is to be avoided at the time of cutting the commissure. Relieving the subvalvular stenosis will increase the atrioventricular blood flow. In the type III lesion it is difficult to get maximum blood flow because of the presence of the papillary muscles.

—*Richard L. Lawton, M.D.*

Complications Following Infundibular Resection in Fallot's Tetralogy. MALCOLM C. MCCORD and S. GILBERT BLOUNT, JR. *Circulation*, 1955, 11: 754.

TWO CASES are presented to illustrate the complications which may arise from infundibular resection in the tetralogy of Fallot when concomitant closure of the ventricular defect is not accomplished. In one patient, a 4-year-old boy who had had an excision of a localized stenotic ring through an incision in the infundibular chamber, a large thin-walled aneurysm developed from the infundibular chamber within 8 weeks postoperatively. At autopsy the original incision was found to be well healed. The sequence of events suggests that this aneurysm developed as a result of the sudden increase in pressure and increase in blood flow through the previously existing thin-walled infundibular chamber which, prior to its surgical excision, had been protected from the high right ventricular systolic pressure and high volume of blood flow by the presence of the infundibular stenosis. The aneurysm developed as a response to this abrupt change in hemodynamics before compensatory hypertrophy of the thin myocardium could develop.

The second complication is illustrated by the case of a 12-year-old boy who recovered from a similar surgical excision of infundibular stenosis. However, after a little more than a year he was found to have developed a functional pulmonic insufficiency. Here the infundibular resection removed the high resistance to blood flow into the pulmonary artery and introduced into the hemodynamic pattern the relatively low resistance of the pulmonary vascular bed. The result of this removal of the obstruction to pulmonary flow was a decrease in right ventricular pressure, the establishment of a systolic pressure gradient between the left and right ventricles, and a left-to-right blood flow through the ventricular defect. The hemodynamic pattern therefore became essentially that of an isolated large ventricular septal defect.

The studies presented here demonstrate that: the view that following infundibulectomy the overriding aorta compensates for the differences in systolic pressure between the left and right ventricles is not necessarily valid. It is anticipated that techniques permitting simultaneous infundibular resection and closure of the interventricular septal defect will soon be realized.

—*David T. Petty, M.D.*

The Surgical Treatment of Coronary Insufficiency. CHARLES P. BAILEY and WILLIAM LIKOFF. *Dis. Chest*, 1955, 27: 477.

CORONARY INSUFFICIENCY is defined as a chronic imbalance between coronary blood flow and the nutritional requirements of the myocardium manifested by myocardial infarction and causing symptomatic disability. From a pathologic standpoint, coronary sclerosis is caused by atheromatous subintimal degeneration resulting in obstruction to the coronary blood flow and becomes demonstrable in the epicardial vessels. Intercoronary arterial communication is provided by a network of small blood vessels which range in size from 40 to 180 micra, and which can increase in size both naturally and artificially to provide a means of significantly increasing the total blood flow to the myocardium.

Surgical treatment is directed to the correction of the imbalance between the existing blood flow and the actual nutritional needs of the heart muscle. The symptoms of coronary insufficiency may be modified by postganglionic resection of the upper dorsal and lower cervical sympathetic chain, by diminishing myocardial demand either by total thyroidectomy or by the administration of radioactive iodine. The effective blood flow through the myocardial capillary bed may be increased by a variety of revascularization techniques. Surface revascularization of the heart can be accomplished by such measures as omentopexy, myopexy, pneumopexy, and jejunopexy. These procedures provide both arteriolar and capillary channels and communications from the grafted tissue to the superficial surface of the heart. Instillation of silicate in the pericardial cavity also provides pathways of arteriolar communications through inflammatory adhesions between pericardium and epicardium. Surface revascularization stimulates at least a 1 plus increase in the intercoronary collaterals. Pericardial poudrage is considered the most satisfactory surface revascularization technique. Implantation of the internal mammary artery is also included in the methods of surface revascularization technique. The present authors claim that the latter procedure is inadequate in affecting the end result of coronary sclerosis because the lumen of the implanted artery usually undergoes thrombosis. Further blood flow studies fail to show any increase in blood supply to the myocardium.

Total revascularization of the heart by surgical methods implies the availability of an auxiliary blood supply for the entire myocardial mass of the left ventricle. In the Beck two-stage procedure an autogenous vascular graft is first interposed between the thoracic aorta and the coronary sinus, and then in the final operation the coronary sinus is partially ligated. A newer modification permits a lateral side-to-side anastomosis between the coronary sinus and aorta with the application of activated cellophane to reduce the lumen of the coronary sinus. By means of arterialization of the coronary sinus, retrograde perfusion with arterial blood is obtained through the coronary veins. This blood traverses the capillary bed of the myocardium but flow ceases after about 3 months because of the progressive enlargement of the intercoronary collateral arteries which take over that function. This development is associated with medial and intimal hyperplasia and thrombosis of the venous capillary bed which is not adapted for blood under high pressure. The effectiveness of the Beck technique appears to be due to the development of the intercoronary collateral arterial system and to extracardiac vascularity derived from surgical adhesions.

Ligation of the coronary sinus per se as a total revascularizing technique seems to limit coronary arterial inflow but provides a stimulus to the development of intercoronary arterial development and distention of the myocardial capillaries, resulting in an increase in size of the vascular bed.

The present surgical experience is restricted to 53 patients who have had the Beck two-stage operation and 18 patients who have had a direct corticosinus anastomosis. There was a total of 9 operative deaths, and in 8 patients the vascular graft became throm-

bosed. It is suggested that any individual below the age of a definitely proved myocardial infarction and 50 with signs of disease progression may be acceptable for operation. Diabetes, hypertension, congestive heart failure, and severely reduced myocardial reserve are additional contraindications for the Beck operation. In patients over 60 years of age, pericardial poudrage is justifiable, and might include coronary sinus ligation or internal mammary artery implantation.

The authors' surgical experience is limited to excision of a ventricular aneurysm complicating coronary artery disease, which was manifested by persistent angina, diastolic gallop rhythm, and congestive failure. Following removal of the ventricular aneurysm without revascularization, the symptoms disappeared.

The life expectancy of patients with heart block and Adams-Stokes syndrome as a complication of coronary artery disease is estimated at 12 to 24 months. Experimentally new neuroconduction pathways bypassing the pathological bundle of His were attempted. In a group of animals, complete atrioventricular dissociation was obtained by surgical division of the bundle of His, after which a pedicled atrial graft was implanted into the ventricular wall for restoration of atrioventricular rhythm. This technique was successful experimentally and was adapted to a patient with heart block. Postoperatively, there was a reduction in conduction time from .22 to .12 of a second.

—B. G. P. Shafiroff, M.D.

ESOPHAGUS AND MEDIASTINUM

The Pharynx and Esophagus; Esophagologic Consultation As an Aid to the Surgeon in Diagnosis and Treatment. WALTER B. HOOVER. *Surg. Clin. N. America*, 1955, 35: 629.

ESOPHAGOSCOPY is important whenever history, physical, and x-ray studies are in any way equivocal in the diagnosis of esophageal disease.

Bony spurs of the cervical spine, insufficient aspiration of the contents of diverticula, and the dilated esophagus are pitfalls in esophagoscopy. Esophageal varices and multiple lesions should be kept in mind in endoscopic study of the esophagus. A method of retrograde dilation of the esophagus by passing several bougies individually past the lesion during endoscopy and then withdrawing them all simultaneously is described.

Spasm of the cricopharyngeus muscle is most important in pulsion diverticula of the upper esophagus and in dilatation of the hypopharynx. The exact etiology of this obstruction is not known. Bilateral vagus paralysis can give a dilated hypopharynx with dysphagia. Unilateral vagal interruption can give similar symptoms with asymmetry of the hypopharynx.

The surgical treatment of upper esophageal diverticula may be either by single stage or two-stage methods. In both, careful dissection of the neck of the diverticulum and partial division of the cricopharyngeus are emphasized as essential to success. Postoperative use of a Levin tube is recommended.

Four case histories, each demonstrating a specific esophageal problem and its management, are given in detail. *—Robert W. Williams, M.D.*

Obstructing Lesions of the Esophagus. DAVID P. BOYD. *Surg. Clin. N. America*, 1955, 35: 653.

DYSPHAGIA, regurgitation, and substernal distress are the principal symptoms of esophageal obstruction, and should always be thoroughly investigated. Esophagoscopy is a mandatory part of this study. Perforation is the principal complication of esophagoscopy. If the perforation is small it is treated with massive doses of antibiotics, but when there is an associated pneumothorax, immediate thoracotomy with esophageal repair is recommended.

Peptic esophagitis is one of the common causes of esophageal strictures. This is frequently seen in association with diaphragmatic hernia, duodenal ulcer, and biliary tract disease. Exogenous strictures are most often due to the ingestion of lye. Most esophageal strictures can be treated conservatively with dilation. Cardiospasm is usually manageable by dilation and drug therapy. However, when a very severe organic stricture does result, and surgery is necessary, the Heller type of cardioplasty is the operation of choice. Occasionally esophagogastrostomy is required.

Pulsion diverticula of both the upper and lower portions of the esophagus are surgical problems. Excision of the diverticulum with repair is preferred to simple inversion. When there is associated scarring with obstruction of the esophagus, this must be cared for at the time of diverticulectomy.

Leiomyomas and fibromas are the principal benign esophageal tumors. When this diagnosis is presumed, thoracotomy and removal are recommended.

Carcinoma of the esophagus may develop at any level. Surgical excision is preferable if possible. Lesions in the upper two-thirds of the esophagus require combined cervical and thoracic approach, and the morbidity and mortality associated with these procedures are still very great. Lesions of the lower third are somewhat less of a technical problem but the results of treatment are still very poor. At the Lahey clinic at present most patients are receiving supervoltage x-ray therapy after resection. No definite statement of the results of this program is yet warranted.

The presence of multiple lesions of the esophagus, such as the association of esophagitis and carcinoma and of carcinoma with a diverticulum, is discussed, and the importance of keeping such associations in mind is emphasized. *—Robert W. Williams, M.D.*

Treatment of Esophageal Varices by Portal Decompression During a Period of 9 Years; Experiences and Results (Neun Jahre Oesophagusvaricenbehandlung durch portale Dekompression; Erfahrungen und Ergebnisse). ALBERT SENN and ARTHUR H. BLAKEMORE. *Chirurg*, 1955, 26: 217.

THE AUTHORS, of the College of Physicians and Surgeons, Columbia University, and the Presbyterian Hospital, New York, discuss the portal and hepatic circulation in the first part of this article and the surgical treatment of esophageal varices caused by extrahepatic or intrahepatic block of the portal vein in the second part.

Important anastomoses exist between the hepatic arterioles and the portal venules and between arterial and portal capillaries which in cirrhosis or other ob-

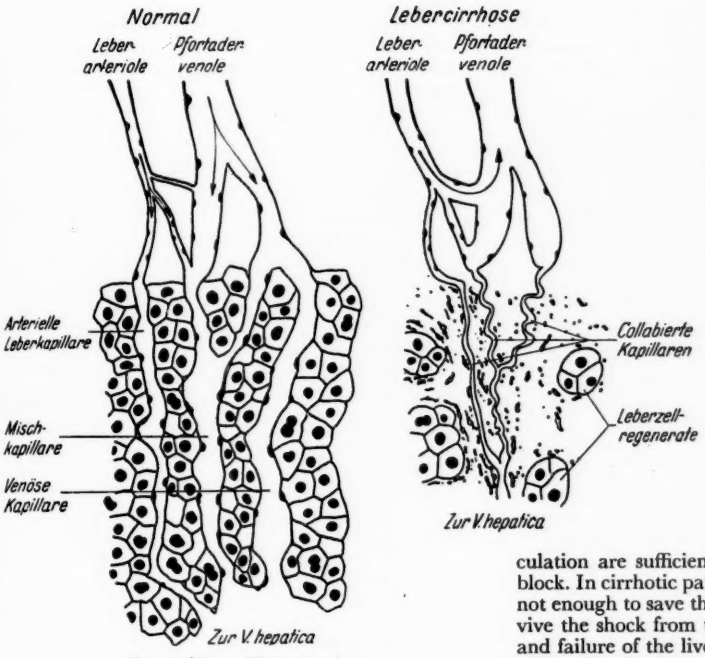

FIG. 1 (Senn, Blakemore).

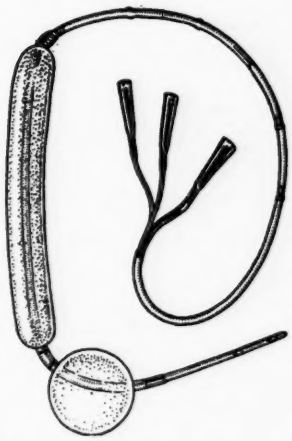

FIG. 2.

struction of the portal circulation dilate and insure sufficient oxygen supply for the liver cells via the hepatic artery (Fig. 1). When in animal experiments the portal circulation was interrupted by mechanical compression of the vein, the blood stream from the hepatic artery increased by 50 to 100 per cent. In severe cirrhosis nearly the entire blood from the portal vein goes directly into the vena cava via the collaterals without coming in contact with the liver cells.

Hypertension in the portal circulation leads to venous dilatation, development of the collateral circulation and anastomoses, splenomegaly, esophageal varices, and ascites. In 70 to 75 per cent of the authors' material the portal hypertension was caused by cirrhosis, whereas in 25 to 30 per cent it was due to extrahepatic block due to thrombosis of the portal vein, pressure of tumors, or other pathologic conditions.

Esophageal varices present a permanent danger for the patient's life as they rupture easily and repeatedly. Large statistics show that only 20 to 50 per cent of cirrhotic patients survived the first hemorrhage for more than a year. The simplest way to determine whether a gastrointestinal hemorrhage is caused by an esophageal varix is application of the Sengstaken-Blakemore probe (Fig. 2). By aspiration of the stomach contents it can be determined if the bleeding has stopped. Only if application of the probe has not succeeded in hemostasis is an x-ray examination with barium meal necessary to rule out peptic ulcer.

In the acute stage of hemorrhage from varices, blood and plasma transfusions and support of the circulation are sufficient in most cases of extrahepatic block. In cirrhotic patients, however, this is frequently not enough to save the patient. Although he may survive the shock from the hemorrhage, chronic anoxia and failure of the liver often lead to coma and death after a few days.

The Sengstaken-Blakemore probe or a Miller-Abbott tube should be applied for one or two days. Then it is emptied but left in place for another 2 or 3 days to make sure that the hemorrhage does not start again. If hemostasis by these methods is impossible, ligation of the varices is necessary. This can be done rapidly by a transpleural approach from the left side.

The therapy of choice for permanent cure of portal hypertension is surgical decompression. Several types of shunt operation are possible: (1) anastomosis between the portal vein and vena cava, (2) splenorenal anastomosis, and (3) anastomosis between other veins of the portal system with veins of the caval system, if necessary with the help of grafts from the femoral or azygos veins or arterial homeotransplant.

If the hypertension is caused by cirrhosis the portal as well as the splenic vein can be used for the shunt. If, however, the hypertension is of extrahepatic origin and the portal vein is obstructed the splenic vein is the most appropriate for the shunt. Therefore, before doing a splenectomy the portal pressure should always be determined, and if the pressure is elevated splenorenal anastomosis should be combined with splenectomy. If splenectomy is done without this precaution and the splenic vein is sacrificed, the surgeon deprives himself of the best chance for a successful shunt operation.

If neither the superior mesenteric nor any other large vein is suitable, a shunt is not feasible and esophagogastrectomy after Humphreys and Phemister is the only alternative to save the patient's life.

To evaluate the risk of the shunt operation, liver profile tests should be done and the blood proteins

should be determined. If these tests and the general condition are unsatisfactory the preoperative treatment consists in a high caloric diet (3,000 calories or more), vitamin B complex, and liver extract injections for about 6 weeks.

During the period from 1945 through 1953 the authors performed shunt operations of different types on 238 patients. In 53 cases the operation was done for extrahepatic block, and in 185 for cirrhosis. The mortality was 7.5 per cent in the extrahepatic cases, and in the cirrhotics it was 23.9 per cent during the first 7 years. Improved preoperative and postoperative treatment and increased experience in determining the indications lowered this proportion to 14.5 per cent during the years 1952 and 1953.

—*Werner M. Solmitz, M.D.*

MISCELLANEOUS

Intrathoracic Purulent Manifestations of Amebiasis (Les manifestations suppures intra-thoraciques de l'amibiase). R. Coirault, H. Coudreau, and J. Girard. *Sem. hôp. Paris.*, 1955, 31: 1603.

The authors report on a series of 20 cases of intrathoracic purulent manifestations of amebiasis observed in soldiers of the French Army in Indo-China. They discuss the various forms of these complications (hepatobronchial fistula, lung abscess, pyothorax, and pyopneumothorax) and publish a number of instructive roentgenograms.

Although these intrathoracic manifestations are sometimes the first clinical symptoms, they are practically always sequelae of a primary hepatitis leading to a liver abscess which ruptured into a bronchus, the lung, or into the pleural cavity. The diagnosis is based on a history of amebiasis or hepatitis, the peculiarity of the expectorated or aspirated pus, its abundance (up to 500 c.c.), and its sterility. Amebae are virtually never found in the pus. In cases without a history of amebiasis and without clinical signs of hepatitis the diagnosis is sometimes quite difficult, but once the correct diagnosis is established the prognosis is always favorable, and under emetine therapy even severe cases are cured in a surprisingly short time.

Six cases of hepatobronchial fistula are discussed in detail. The author distinguishes three stages. In the first stage hepatitis with tenderness and enlargement of the liver is the presenting sign. The thoracic symptoms are limited to a circumscribed diaphragmatic pleurisy with friction rales. The second stage is characterized by abundant expectoration of pus, often preceded by hemoptysis. In fresh cases the pus has a chocolate-colored appearance; in old liver abscesses it is creamy and intermixed with blood. Amebae are never found in the pus. This stage rarely lasts longer than 3 days and is followed by the stage of recovery. The hepatitis and the clinical and roentgenological signs recede rapidly.

In another 6 of the authors' cases lung abscess due to amebiasis was present. Amebae may enter the lung parenchyma by the blood or lymph system, or they may be transported into the lung by rupture of a liver abscess. The correct diagnosis is often difficult, especially when clinical signs of hepatitis are missing. Amebae are never found in the expectorations; however, the abundant chocolate-colored sputum, the failure of antibiotic therapy, and the prompt success of emetine establish the diagnosis.

The gravest form of endothoracic amebiasis is the pyothorax, caused by rupture of a liver abscess into the free pleural space. In typical cases the onset is brusque and dramatic: a patient who has been febrile for a shorter or longer period experiences abruptly a sharp stablike pain in the chest, has a violent attack of cough, and goes into shock. Dullness on percussion and paracentesis of the pleura establish the diagnosis. The therapy is evacuation of the pus by aspiration, internal treatment with emetine, and topical and systemic antibiotic therapy because these cases are often complicated by secondary bacterial infections. Other cases of amebiasis have a more insidious onset; the chest pain is less marked, and dyspnea develops only gradually.

In summary, except for some rare and questionable cases of hematogenous lung abscess, all endothoracic purulent manifestations of amebiasis are complications of a liver abscess which has ruptured into the thoracic space.

—*Werner M. Solmitz, M.D.*

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Surgical Management of Massive Acute Upper Gastrointestinal Hemorrhage. CLAUDE E. WELCH, ARTHUR W. ALLEN, and GORDON A. DONALDSON. *N. England J. M.*, 1955, 252: 921.

THE AUTHORS have classified massive hemorrhage as that which causes a fall in the hemoglobin to 7 gm. per cent or below, or requires five or more transfusions during the period of hospitalization. They regret that they have not had a system of determining the blood volume to establish a more accurate classification.

This article deals only with massive upper intestinal bleeding from peptic ulcer, which comprised approximately 55 per cent of the cases encountered at Massachusetts General Hospital, Boston.

The indication for emergency operation is persistent bleeding at a rapid rate or recurrence of active bleeding after a free interval in a patient with a positive or presumptive diagnosis of ulcer or tumor. Early x-ray examination is frequently required to establish the diagnosis when the patient can be carried over. These authors remark that fortunately hemorrhage originating from a hiatus hernia or gastritis usually stops spontaneously far more frequently than in the case of ulcer, and therefore they suggest a more conservative regime when one of these lesions is suspected. Older patients should be operated upon as soon as the diagnosis of massive hemorrhage from ulcer is made if other conditions do not preclude surgery. Patients with gastric ulcers are more likely to die from hemorrhage than those with duodenal ulcers and therefore operations should not be delayed. If the supply of compatible blood is low, as is often the case, the operation should be done before the bank is exhausted.

It is the authors' belief that every patient who has a single massive hemorrhage from ulcer should be operated upon, as previous follow-up study has shown recurrent bleeding months or years later in 25 per cent of such patients who recovered after medical therapy alone.

The authors have found that pulmonary complications were by far the greatest cause of death in their postoperative patients. The reason for this, they emphasize, was aspiration pneumonia which can come on at any time from the induction of anesthesia until the second postoperative week. To preclude this as far as possible, a Levine tube is always passed preoperatively, and before the anesthetic is given a cuffed intratracheal tube is passed after the larynx is cocainized. Thereafter, any vomiting is under perfect control. They have felt it advantageous to use a catheter introduced in a retrograde fashion through the efferent jejunostomy loop into the stomach, as first described by Allen and Donaldson. This method allows much better clearing of the respiratory tree than can occur with a Levin tube lying in the pharynx in the postoperative period. Furthermore, this catheter can be tolerated much better and longer than a nasal tube. It is especially important to use this technique in elderly, depleted, and very ill patients who are well known candidates for postoperative pulmonary complications.

A study was made of the mortality rates with conservative and radical treatment in massive upper intestinal bleeding from 1923 to the present time. The obvious conclusion is that the over-all death rate from hemorrhage has not diminished, but has increased slightly despite the much wider application of surgery. The authors wonder if we are entirely on the wrong track and if early surgery should be abandoned on the basis that more patients who might recover with conservative treatment are dying from operations. In considering the upward trend of the years of life expectancy, the gradual trend toward more radical operations to include the entire stomach and portions of the esophagus, and other minor aspects, it would seem that this supposition is incorrect.

These authors conclude with a statement that the continued lowering of the mortality will depend on methods outlined for the prevention of postoperative complications and earlier surgery on patients with massive hemorrhage who are over 60 years of age.

—*Matthew H. Evoy, M.D.*

Diagnosis and Treatment of Acute Hemorrhages of the Digestive Tract (Diagnostic et traitement des hémorragies digestives aiguës). FR. MOYSON and A. DE SCOVILLE. *Acta chir. belg.*, 1955, Supp. 1.

ACCORDING TO STATISTICS and to the authors' own material, acute hemorrhages of the upper gastrointestinal tract are due in 70 per cent of cases to peptic ulcers (the majority of which are duodenal ulcers), in from 10 to 12 per cent to esophageal varices or gastritis, in 4 per cent to carcinoma of the stomach, in 1 per cent to hiatus hernia or esophageal lesions other than varicosities, while in the remaining cases various rare conditions are responsible for the bleeding.

Roentgenologic examination in the presence of a hemorrhage is harmless and very valuable. A coexistence of several lesions, such as a peptic ulcer and esophageal varicosities, or a hiatus hernia and a diverticulum may be demonstrated. If cirrhosis of the liver is suspected, transparietal splenoportography may be employed.

The authors do not favor esophagoscopy because varices may collapse and remain invisible after a grave hemorrhage. On the other hand, gastroscopy is considered a valuable diagnostic procedure.

The bromsulfalein retention test is of no great value because retention of the dye may be normal in extrahepatic block with ruptured esophageal varices.

As to therapy, the authors subscribe to Lewis' dictum that "the ideal combination is a keen young physician and a somewhat reluctant surgeon."

The number of operations for a bleeding peptic ulcer can be reduced considerably by aspiration of the gastric contents followed by blood transfusion and the intragastric administration of thrombin and antacids. An emergency operation is indicated in patients

more than 50 years of age who have had an ulcer longer than 6 months. Furthermore, gastric resection should be performed on all patients, irrespective of their age, who have a recurrence of active bleeding within 48 hours or who continue bleeding in spite of supportive measures.

Blood transfusion and induction of the Sengstaken-Blakemore tube are recommended for the treatment of esophageal varices. After cessation of the shock splenoportography should be done. If the block is intrahepatic, transesophageal ligation of the esophageal varices will stop the bleeding, while ligation of the splenic artery may or may not accomplish hemostasis. If the block is extrahepatic, conservative treatment is indicated. Definitive treatment after cessation of hemorrhage consists of splenectomy, splenorenal shunt, or esophagogastrectomy. In patients with cirrhosis of the liver portacaval anastomosis or arterialization of the portal blood should be done,

—*Joseph K. Narat, M.D.*

Smooth Muscle Tumors of the Alimentary Canal. SAMUEL F. MARSHALL and JAMES W. CHERRY. *Surg. Clin. N. America*, 1955, 35: 719.

SMOOTH MUSCLE TUMORS are found infrequently in the gastrointestinal tract as compared to their incidence in other systems of the body. These lesions may be and often are asymptomatic. Since the prognosis is often better than, and the treatment different from that of more common lesions with which myomas are confused, it is essential to consider these tumors in the diagnosis of any condition in which there is a bleeding or an obstructing lesion in the alimentary canal. Symptoms do not occur until the leiomyoma reaches a size sufficient to obstruct the passage of the alimentary canal or until ulceration of the mucosa overlying the tumor occurs with subsequent hemorrhage. Leiomyoma cannot be distinguished from leiomyosarcoma except by careful microscopic examination. The authors have reported a series of 61 smooth muscle tumors of the alimentary canal, both benign and malignant, as seen and treated at the Lahey Clinic in Boston.

Esophagus. Six cases of leiomyoma of the esophagus are reported; these were equally divided as to sex and occurred between the ages of 20 and 60 years. Leiomyomas in the esophagus produce symptoms even more infrequently than leiomyomas in other parts of the alimentary canal. It is only when these tumors become large that angulation of the esophagus and pressure on the surrounding mediastinal structures give rise to such symptoms as retrosternal distress, epigastric discomfort, fullness after eating, weakness, loss of weight, vomiting, and dysphagia. These lesions are consistently extraluminal and usually do not obstruct the passage of food. The diagnosis of benign esophageal tumor is made with the roentgenogram. Barium studies reveal a defect in the esophageal shadow that is smooth and characteristically half-moon shaped without distortion of the mucosal pattern.

Esophagoscopy is not of great value in this particular instance as the legion is extramucosal. Biopsy of a leiomyoma through the esophagoscope is definitely contraindicated if surgical extirpation is planned as a subsequent procedure.

The treatment of esophageal leiomyomas is surgical removal. This is best accomplished by enucleation without entering the lumen of the esophagus. A left transpleural approach to the tumor is recommended in order that the stomach may be brought into the chest for esophagogastrostomy should resection of the esophagus be necessary. Malignant smooth muscle tumors in the esophagus are extremely rare. The authors found none in their series. All of the patients survived the surgical procedure and none has had a recurrence.

Stomach. Leiomyoma is the most common smooth muscle tumor encountered in the stomach. However, these lesions do not often assume clinical significance because they rarely reach a size large enough to cause symptoms or to be confused with some other surgical lesion of the stomach. Twenty-eight leiomyomas of significant size and 16 leiomyosarcomas have been encountered during 3,000 surgical procedures performed on the stomach at the Lahey Clinic. Hematemesis was the most common symptom in both groups of myomatous tumors. It was present in 10 of the 16 patients with sarcomas and 10 of the 18 who had clinically significant benign tumors. Melena, mild indigestion, and epigastric pain occurred in the order given. Ulceration of the mucosa overlying the tumors was common and was present in all of the lesions which had bled prior to surgical intervention. Symptomatology and roentgen examination were of no value in differentiating the benign from the malignant myomas. Barium studies, however, may be of value in the recognition of these tumors. The sarcomas, with one exception, were of low grade malignancy. In only 2 of the sarcomas were metastases demonstrable at the time of operation. Local excision was deemed adequate in 3 of the benign cases and partial gastric resection was required in the others. In the malignant groups, 3 patients were treated by wide local excision, 10 by partial gastrectomy, and 3 by total gastrectomy. There were no postoperative deaths in either of these groups. All but 2 of the patients who had sarcomas are living at this time. All but 2 of the survivors are free of any evidence of their disease from one to more than 10 years since operation.

Small intestine. Smooth muscle tumors of the small bowel are often asymptomatic and are frequently discovered coincidentally at autopsy or during laparotomy for some other surgical condition. When they are symptomatic, the lesions manifest themselves by hemorrhage, obstruction, or the presence of a palpable mass in the abdomen. These lesions may be entirely submucosal, subserosal, or in the shape of a dumb-bell. The subserosal variety reportedly becomes malignant in about 16 per cent of the cases, whereas malignant degeneration has not as yet been observed to occur in the submucosal type. The ulcerlike pain associated with leiomyomas in the small intestine is thought to be due to the erosion of the mucosa overlying the tumor. Although the roentgenographic picture of a leiomyoma in the small bowel is quite characteristic, the diagnosis is rarely made mainly because of the low index of suspicion on the part of the observer and the fact that symptoms due to this disease are usually attributed to the more common lesions productive of similar symptoms. In the authors' series there were 14

leiomyomatous tumors in the small bowel of which 6 were found incidentally at laparotomy or autopsy. There were 8 leiomyomas in the small bowel primarily responsible for the symptoms which led to the surgical exploration of the abdomen. Five of this group were benign, the 3 others were malignant. The diagnosis was not suspected prior to surgery in any of these 8 patients.

Colon and rectum. The majority of leiomyomatous tumors arising in the large bowel are found in the rectum. The size and location of these tumors again determine the symptoms characterizing the disease. A palpable mass is noted in about 40 per cent of the lesions in the colon. Almost all smooth muscle tumors in the rectum can be detected with the examining finger and can easily be seen with the proctoscope. The mucosa is usually intact. Rectal myomas are usually associated with signs of partial obstruction such as diarrhea, constipation, tenesmus, sensation of a mass, and painful or difficult defecation. Small well circumscribed leiomyomas can safely be removed by local excision under spinal anesthesia if the tumor is low in the rectum. If resection is necessary to remove the tumor completely, an operation designed to preserve sphincter continence would seem indicated.

The authors' series included 7 myomatous tumors in the large bowel, one of which was in the transverse colon, 2 in the sigmoid, and 4 in the rectum. Two of these lesions were associated with other lesions for which Miles resection was indicated, and one lesion, obviously malignant, had formed the primary indication for an abdominoperineal proctectomy.

—*Harvey N. Lippman, M.D.*

Malignant Lymphomas of the Gastrointestinal Tract. KENNETH W. WARREN and JAMES B. LITTLEFIELD. *Surg. Clin. N. America*, 1955, 35: 735.

ALTHOUGH MALIGNANT LYMPHOMA is essentially a systemic disease, a localized or circumscribed variety is recognized which may be approached surgically in anticipation of a fair percentage of apparent cures. Such a lesion is more commonly found in the gastrointestinal tract. Approximately 0.9 per cent of the malignant lesions of the gastrointestinal tract are solitary lymphoid tumors. In the past localized intrinsic lymphomas of the stomach have been treated by partial or total gastrectomy. In general, the patients have fared better than patients in the lymphoma group as a whole. There has been less enthusiasm about the management of lymphomas of the small and large intestines and particularly of the rectum. Localized malignant lymphomas of the cervical and axillary regions have on occasion been approached by radical dissection of these areas.

The authors have reviewed all of the intrinsic lymphomas of the gastrointestinal tract treated at the Lahey Clinic in Boston, Massachusetts since 1933. There were 49 patients in this study of which 14 were females and 35 males. The youngest patient in the group was 30 years of age and the oldest 78. The average age for the group was 54.4 years.

Thirty of these lesions involved the stomach. The duodenum was affected in 2 cases, the jejunum in 5, the ileum in 3, the cecum in 2. The rectum was involved in 7 cases.

The authors have classified malignant lymphomas into six groups as follows: (1) lymphoma, unclassified, (2) lymphosarcoma, (3) lymphocytoma, (4) reticulum cell sarcoma, (5) macrofollicular lymphoma, and (6) Hodgkin's disease.

The gross appearance of malignant lymphomas of the gastrointestinal tract is extremely variable. They may be (1) localized ulcerating lesions, (2) fungating or annular growths, or (3) localized or widespread thickening of the wall with central ulceration. On cut section lymphomas are yellowish-gray in color, firm and homogeneous, with a glistening surface. They appear to begin locally within the lymphoid tissue as enlarged masses of solitary follicles in the submucosa. Only 50 per cent of the palpable nodes observed at operation in this series showed the presence of tumor. It is noteworthy that the precise limits of the tumor are difficult to determine even at operation.

In a series of 406 patients with malignant disease of the stomach operated upon at the Lahey Clinic from 1941 to 1945, sarcomas were noted to be present in 16. Fourteen of these 16 sarcomas were of lymphoid origin. Eight of the 14 malignant lymphomas were classified as Hodgkin's disease. The clinical behavior of malignant lymphomas of the stomach is similar to that of carcinomatous lesions involving this organ. The physical examination has been of little help in the differential diagnosis of these lesions. Only on rare occasions will the roentgenologic studies differentiate a primary lymphoma from a carcinoma.

In this series of 30 patients, subtotal gastrectomy was performed in 20 patients and total gastrectomy in 6. Laparotomy and biopsy were performed in the remaining 4. There were 2 postoperative deaths. Ten of the 24 patients who survived gastric resection lived 5 years or more and 4 are living and well beyond 10 years. The unclassified variety of lymphomas and the lymphosarcomas appeared to give the most favorable prognosis. Of 4 patients with malignant lymphoma of the stomach treated by x-ray therapy alone, only one survived more than 3 years. It is evident that surgical excision of malignant lymphoma of the stomach affords a far better prognosis than does a similar operation for carcinoma of this organ.

Malignant lymphoma of the duodenum was observed in 2 patients in the present series, both of which were treated by gastroenterostomy and postoperative x-ray therapy. One of these patients is alive 7 years after operation but has had recurrent jaundice; the other patient returned 3 years after the original treatment and was subjected to a subtotal gastric resection. This patient is living and well 6 years after the original biopsy.

Five patients were observed with lymphoma of the jejunum and 3 patients with lymphoma of the ileum. Six of these 8 patients were resected. Of 3 patients who were followed up after resection, one was living and well 16 months, another 28 months, and a third 10 years after operation.

Of 2 patients with malignant lymphoma arising in the cecum one was treated by resection, the other by diversional ileotransverse colostomy. Neither of these patients was alive 4 months after operation.

Of 7 patients with malignant lymphoma of the rectum, 3 had localized polyps, of which 2 were treated

by simple excision and the third by simple excision and x-ray therapy. These 3 patients are alive and well 7, 9, and 19 years, respectively, after treatment. The remaining 4 patients had extensive lesions of the rectum. Two of these patients were dead in 4 months; one received x-ray therapy and survived 6 years without evidence of recurrence. Another patient was treated by abdominoperineal resection and is living and well 8 months after operation.

The authors conclude that while the number of cases available for analysis is too small to permit rigid conclusions, it would still appear reasonable from these data to pursue an aggressive attitude with radical resection of localized malignant lymphomas of the gastrointestinal tract. Such efforts may be particularly rewarding in the case of gastric lesions in which the 5 year salvage is about 40 per cent. Lesions of the duodenum are perhaps best treated by gastroenterostomy and postoperative deep x-ray therapy. Malignant lymphomas of the small intestine and cecum may not afford a good prognosis in this series, but it is apparent that radical resection should be continued. Local excision of circumscribed lesions of the rectum with or without x-ray therapy would appear to give satisfactory results.

—*Harvey N. Lippman, M.D.*

Leiomyosarcoma of the Jejunum, with 2 Case Reports and a Review of the Literature. Guy W. Horsley and R. L. Means. *Ann. Surg.*, 1955, 141: 799.

The 2 cases of leiomyosarcoma of the small intestine reported bring the total number reported in the literature to 110.

In the majority of patients, chronic intestinal bleeding, weakness, and weight loss are the presenting symptoms. The cause of the bleeding is usually obscure when the tumors are not palpable. Even at laparotomy, the tumors may be overlooked if a careful search is not made of the entire intestinal tract. Because of this, a careful and detailed small bowel roentgenogram study should be done in all cases of intestinal bleeding not diagnosed by the usual methods. Filling defects, irregularities, and fistulous communication with the tumor cavity should be sought. At operation, the small intestine from the duodenojejunal junction to the ileocecal valve should be thoroughly explored.

—*Samuel Kahn, M.D.*

Cancer of the Colon and Rectum. Richard B. Cattell, Douglas H. MacKenzie, and Bentley P. Colcock. *Surg. Clin. N. America*, 1955, 35: 823.

In the year 1949 more persons died from cancer of the colon and rectum than from any other form of malignant disease. This condition is exceeded in frequency in the male by carcinoma of the stomach and in the female by carcinoma of the uterus and breast.

Two-thirds of all cancers of the intestinal tract lie within reach of the examining finger or sigmoidoscope. The other third may be detected with considerable accuracy by barium enema examination. The patient with cancer of the colon or rectum may be offered a 50 per cent chance of cure by surgical treatment. If the lesion is still confined to the bowel and there is no evidence of lymphatic or blood vessel invasion, the 5 year survival rate may be as high as 70 per cent.

The authors have reviewed the records of all patients with cancer of the colon or rectum seen or treated at the Lahey Clinic in Boston, Massachusetts during the year 1953. There were 148 patients with primary malignant disease and 16 with recurrent carcinoma.

The ages of patients with primary lesions varied from 31 to 84, with an average of 60.8 years. Two and seven-tenths per cent of the patients were under the age of 40, and 16.2 per cent were over the age of 70. Fifty-eight and one-tenth per cent were males and 41.9 per cent were females.

The largest number of lesions was found in the rectum (37.3 per cent). In more than 75 per cent of the entire group, the left half of the colon and the rectum were involved. In almost 16 per cent the cecum, ascending colon, and hepatic flexure were involved. In 6.8 per cent of the cases the lesion was in the transverse colon. The average age of the patients in these various groups was the same. Two patients had more than one malignancy.

Pain and a change in bowel habit were noted in over two-thirds of all the cases. Bleeding occurred in more than 75 per cent of the patients with cancer of the rectum and rectosigmoid as compared to 50 per cent of the patients with cancer of the right colon. Anemia, however, was found in 50 per cent of the patients with lesions of the right colon as compared to an over-all incidence of 20.6 per cent. Weight loss was present in more than half of the entire group and an abdominal mass was felt in 13.3 per cent.

The duration of symptoms varied from a few days to 4 years. In the patients with primary lesions the average duration of symptoms was 7.7 months. There was no difference in the duration of symptoms between lesions of the right and left colon.

There was a delay attributed to the patient's physician in about 28 per cent of the cases. This delay was noted more frequently in lesions of the cecum (50%). The period of delay varied from several months to a year. Six patients with cancer of the rectum and rectosigmoid had been subjected to a hemorrhoidectomy within a few months prior to the establishment of the definitive diagnosis.

An abdominal mass was palpable in 42.7 per cent of the patients with a lesion of the right colon. The lesion was felt on digital examination in 63.4 per cent and observed on proctoscopic examination in 98.3 per cent of patients with cancer of the rectum and rectosigmoid. The proctoscopic examination was positive in more than half of the entire group. The biopsies of the specimens taken at this examination were accurate in 94.7 per cent.

The lesion was considered operable in 100 per cent of the cases and resectable in 94.5 per cent. A curative resection was performed in 70.9 per cent of the patients. An abdominoperineal resection was carried out in 98.2 per cent of the patients with cancer of the rectum and in 78.5 per cent it was considered a curative procedure. In 77.6 per cent of the patients with carcinoma of the rectum, rectosigmoid, or sigmoid, a curative resection was performed, whereas resection was considered curative in only 64.2 per cent of the patients with lesions of the right colon. Fourteen and seven-tenths per cent of the patients had hepatic

metastases at operation. Blood vessel invasion was demonstrated in 31 per cent of the resected specimens and mesenteric lymph node involvement was found in 27 per cent. Fifty-two per cent of the resected specimens demonstrated serosal involvement by the malignant condition. In 13 patients, or 37.1 per cent, local invasion was the only evidence of spread of the disease. The pathologist reported adenocarcinoma in 85.8 per cent of the cases, adenocarcinoma with mucinous foci in 8.7 per cent, carcinoma simplex in 4.2 per cent, and epidermoid carcinoma in 2.02 per cent.

Of 24 patients with lesions of the cecum, ascending colon, and hepatic flexure, 22 had a right colectomy. Of 9 patients with a lesion of the transverse colon, 4 had a right colectomy and resection of the transverse colon and 3 had a segmental resection. Of 8 patients with lesions of the descending colon, 4 had resection of the left transverse and descending colon and 4 had a segmental resection. Of 29 patients with a sigmoid lesion, 4 had a Miles resection and 25 had a segmental resection. The 55 patients with cancer of the rectum and the 4 patients with cancer of the anus had a Miles combined abdominoperineal resection. One patient with polyposis had a subtotal colectomy.

Postoperative complications developed in 17.5 per cent of the patients. The average duration of the hospital stay was 20.9 days. These procedures were performed with an operative mortality of 6 per cent. Seven of the 9 deaths were attributed to cardiac disease, of which myocardial infarction was the major representative.

A review of the patients with recurrent carcinoma indicates that little except palliation can be accomplished by any secondary operation for cancer of the colon and rectum. The chance for a cure in the great majority of patients with colonic cancer exists only at the time of the original procedure.

—Harvey N. Lippman, M.D.

The Lateral Spread of Carcinoma of the Rectum. J. FREIDIN. *Austral. N. Zealand J. Surg.*, 1955, 24: 283.

THIS REPORT is concerned with the incidence of lateral lymphatic spread in carcinoma of the rectum and its significance in the surgical approach in this disease.

In a review of the literature the author cites reports from Lockhart-Mummery (1926), Coffey (1931), Dukes (1943), Gilchrist and David (1947–1948), and other authors. The author interprets the results from these various investigations as indicating that lesions situated in the lower part of the rectum have a poorer prognosis than the high ones, and that this factor of level influencing the prognosis is particularly marked in the series which show lymph node metastases.

The author states that in looking for lateral nodal spread the position of the lateral vascular bundle (middle hemorrhoidal artery and vein) is of primary importance. These structures were identified during the perineal part of synchronous abdominal perineal resections.

The materials and method used are as follows: 100 specimens of carcinoma of the rectum and sigmoid colon were examined. Particular attention was paid to the zone of 1 to 2 inches of pararectal fat above the levators ani which was known to contain the lateral vessels. These vessels, and whether or not there were accompanying lymph nodes, were charted and the lymph nodes were preserved, sectioned, and stained.

The author found a good deal of variation in location of the peritoneal reflection, this ranging from 5 to 12 cm. above the anal margin anteriorly. The lateral point of peritoneal reflection varied from 6 to 14 cm. above the anal margin. The author found that the lateral vessels, when present, were more consistent in location and the level ranged from 4 to 8 cm. above the anal margin.

The specimens were divided into 3 groups according to the level of the tumor in relation to the lateral vessel fields of spread.

Thirteen tumors were below the lateral fields. Five actually had lateral vessels present. Two of these patients had related lymph nodes involved by neoplasms.

Forty-eight tumors were situated at the lateral field level (4 to 8 cm. above the anal margin). In these 48 specimens lateral vessels were present in 34 and lymph nodes were related to them in 18. Ten of the specimens with lymph nodes were involved by neoplasms.

In these two groups lateral spread was shown to occur despite a superior avenue of spread which was either free of metastases or contained only a small number of metastases.

In the third group of tumors situated above the lateral fields, 23 of 39 showed lateral vessels, but only 4 had related lymph nodes and none of the 4 showed evidence of malignancy. It is the author's opinion that lateral spread of carcinoma of the rectum via the lymph nodes along the lateral rectal vessels occurs when the tumor is situated either below or at the level of the lateral vessel fields and may be present when the superior route of spread is still uninvolved.

—John H. Schneewind, M.D.

The Distal and Proximal Margin of Resection in Carcinoma of the Pelvic Colon and Rectum. JOEL W. BAKER, LESTER H. MARGETTS and ROBERT P. SCHUTT. *Ann. Surg.*, 1955, 141: 693.

IN CARCINOMA of the lower sigmoid and upper rectum, irrespective of whether an anterior or abdominoperineal resection is performed, the question remains as to how far to extend the proximal resection. The authors report on a 3 to 15 year follow-up of 231 patients operated upon at the Mason Clinic, Seattle, for carcinoma of the rectum or pelvic colon; their choice of operative procedure is outlined for these lesions; and they present technical and pathologic considerations in extending the proximal resection.

In the first of the three groups reported on, the level of the lesion was below the lateral reflection of the pelvic peritoneum. For this group, the writers now subscribe to doing no less than a Miles combined resection. Below this level the lesion was in unrestricted close proximity to the pelvic floor, the restraining influence of the peritoneal investment was lacking, and certainly a generous margin distal to the lesion could be resected and continuity restored. A follow-up of 97 patients subjected to the Miles resection and 17 subjected to the anterior resection for lesions at this level revealed a 60 per cent 3 year arrest in each group. Except for palliation, anterior resection at this level was done in only a few patients who were adjudged suitable for it because of lack of gross infiltration be-

yond the submucosa and absence of regional metastasis. Two in the anterior resection group with positive nodes did not survive 3 years, while in the Miles group, 8 of 25 patients with positive nodes survived 5 years.

In the second group were the cases at or just above the rectosigmoid juncture. Anterior resection here restricted the distal margin of both mural and lymphatic resection and it is believed that the majority of the patients were subjected to the Miles resection. Survival rates here slightly favored the Miles group, being 61 per cent as against 57 per cent 5 year survival. The importance of follow-up sigmoidoscopic examination was stressed, since recurrences can readily be detected in the patients with anterior resection and they can possibly still be salvaged by the combined resection. Because of local mucosal recurrences, and the fact that the meager distal margin in anterior resection is out of harmony with the margin advocated in cancer surgery elsewhere, and because satellite polyps can be demonstrated to have a malignant potential for a longer sleeve of colon than has been generally appreciated, the authors were reluctant to apply the anterior resection for cancer at the rectosigmoid level except for palliation.

In the third group were lesions in the middle and upper sigmoid and for these there seemed little argument against preserving a short rectal ampulla for anastomosis. The end-to-side rectosigmoid anastomosis often permitted a deeper anterior anastomosis and therefore a wider distal resection than the conventional end-to-end anastomosis. A total left colectomy has been adopted by the authors for these lesions in the past few years.

Next to earlier discovery and removal of the precursor mucosal polyps of the rectum and sigmoid, the higher resection of the preaortic and mesenteric lymphatic vessels, in order to encompass more widely the proximal lymphatics to which metastasis is more common, would seem to be the endeavor with the greatest promise of increasing a 5 year arrest. For cancer of the rectum and pelvic colon the proximal lymphatic resection is extended by stripping the aorta and vena cava up to the pancreas and ligating the inferior mesenteric artery at its origin. Mobilization of the high splenic flexure is facilitated by first freeing the reflections of both the descending colon and the left half of the transverse colon. After radical left colectomy, the reach of the remaining transverse colon for anastomosis depends upon the length of the midcolic artery. The splenic flexure or the descending colon is utilized if anastomosis without tension cannot be made with the transverse colon; adequate blood supply to the descending colon is furnished by the marginal artery.

In 30 per cent of the cases of colonic cancer in their clinic the authors have demonstrated benign or malignant satellite polyps situated near and at a distance beyond the primary lesion. For the proximal colon, the detection of polyps can be enhanced by endoscopy above the contemplated level of resection during operation. This becomes of particular importance when technical difficulties dictate a compromise instead of total left colectomy.

—*James H. Holman, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

The Recognition and Medical Management of Chronic Relapsing Pancreatitis; Including Preoperative Preparation and Postoperative Care of the Patient. FRANCIS E. MCDONOUGH. *Surg. Clin. N. America*, 1955, 35: 775.

THE END PICTURE of chronic relapsing pancreatitis begins with a process similar to acute pancreatic edema or sublethal pancreatic necrosis and progresses in stages marked by clinical remissions and exacerbations. Thus, the problem can present itself in any stage of development as well as in symptomatic remission or exacerbation. The diagnosis results from the successful attempt to evaluate the symptoms of this disease in relation to information obtained by laboratory and roentgenographic studies. The predominant symptom of chronic relapsing pancreatitis is pain. It is essentially epigastric in location and is referred to the back and left hypochondrium. Early in the course of this disease it is colicky in character and usually severe, but episodic. Later it becomes almost constant with exacerbations of intensity. Because of the close proximity to the pancreas, there is associated disturbance of the upper gastrointestinal tract resulting in pylorospasm and gastrospasm as well as edema and spasm of the duodenum. This may produce dyspepsia, burning sensations, and ulcerlike distress.

Nausea and vomiting may be reflex in character in the early stages of the disease, but later retention vomiting, due to partial duodenal obstruction, may develop. Steatorrhea occurs in only one-half of the patients. It tends to follow bouts of pain in the initial stages and becomes persistent only after acinar atrophy is far advanced. Marked protein loss may occur from creatorrhea, which parallels the variations in steatorrhea. Most of these patients have lost from 15 to 50 pounds in weight. Diabetes occurs in less than half of them. Jaundice usually occurs during painful relapses and may be indicative of associated biliary tract or hepatocellular disease. Between attacks of pain there are no physical findings to suggest disease in the pancreas unless large palpable pseudocysts have developed. During painful exacerbations, tenderness in the epigastrium may constitute the only positive finding.

Roentgenographic evaluation of the biliary and gastrointestinal tracts may be most valuable in the diagnosis of chronic pancreatitis. Duodenal ulcer, cholecystic disease, coronary heart disease, aneurysm of the abdominal aorta, carcinoma of the pancreas, renal disease, and retroperitoneal sarcoma must all be considered in the differential diagnosis. The presence of pancreatic lithiasis is almost pathognomonic of chronic relapsing pancreatitis. Large pancreatic pseudocysts may cause smooth pressure deformities of the stomach. Serum amylase and serum lipase may be elevated in the early course of the disease but are usually not elevated in more advanced cases. In more than 200 cholangiograms, following the intravenous injection of cholografin, the authors have not been able to demonstrate obstruction of the common bile duct secondary to enlargement of the head of the pancreas in chronic relapsing pancreatitis.

The degree of pancreatic damage and the frequency and severity of painful seizures will determine whether treatment should be medical or surgical. As a result of recent studies, it is apparent that surgical procedures designed to relieve ductal obstruction constitute the only theoretically sound therapeutic approach to this disorder. Medical management is indicated in patients in whom it is believed that the disease has reached a burned-out, painless stage characterized by either steatorrhea or diabetes.

A program designed to prevent spasm in the gastrointestinal tract has been shown to give the best results in the medical management of chronic relapsing pancreatitis. The authors emphasize the importance of diet, sedations, antispasmodics, and the avoidance of all bowel irritants. (The reader is advised to consult the original article for the specific details of the dietary management of this condition.) As an antispasmodic sedative the authors prefer a mixture of sodium phenobarbital and tincture of belladonna. The anticholinergic drugs may be used for tolerance in addition to this mixture. Demerol is recommended for relief of pain of sufficient intensity to require a narcotic. All gastrointestinal irritants are eliminated from the diet. These include alcohol, laxatives, bile salts, and cholagogues. Bowel hygiene is maintained in the simplest manner by assuring an adequate water intake. A half glass of orange juice or prune juice may be used on occasion as a mild laxative. Oil retention enemas are advocated for more stubborn constipation. Diabetes, if present, is controlled with insulin. Pancreatin is advised for those cases in which steatorrhea and creatorrhea result from advanced acinar destruction.

A program such as this is advised for periods of weeks or months, depending upon the patient's symptoms. The diet may then be progressively liberalized if the patient remains free of symptoms.

The preoperative preparation for patients with chronic relapsing pancreatitis is much the same as the program outlined for the medical management of this disorder. Jaundiced patients receive special consideration in accordance with concepts already well established. Anemia, fluid, and electrolytic imbalance, nutritional edema, and vitamin deficiency are all corrected before the patient is considered ready for operation.

The postoperative management of these patients does not differ materially from that employed following any upper abdominal operation. By the time the skin sutures are removed on the eighth postoperative day, most patients have progressed to the type of diet which is usually prescribed under the medical management of this disease. The patient leaves the hospital under a similar program of medical management. Once the obstructing factors have been corrected, the pancreas, like the liver, has a tremendous regenerative capacity. Diabetes and digestive enzymic deficiencies may correct themselves after the proper surgical procedure. —*Harvey N. Lippman, M.D.*

GYNECOLOGY

UTERUS

A Case of Advanced Carcinoma of the Cervix with Low Renal Function; a Plan for Pelvic Exenteration in 2 Stages. J. N. KARANDE and RAMAN M. NADKARNI. *J. Obst. Gyn. India*, 1955, 5: 215.

A CASE of far-advanced carcinoma of the cervix with bilateral hydroureter and left hydronephrosis due to pelvic spread is reported. It was decided to do a pelvic exenteration, but because of the poor condition of the patient it was done in two stages. In the first stage a bilateral ureterocutaneous anastomosis with ligation of the iliac vessels was done. This allowed for the improvement of renal function, and the ligation of the feeding vessels retarded the growth of the tumor with improvement in the patient's general condition. The second stage operation, which is a major procedure, is then bloodless and managed with a minimum use of clamps. This second stage was performed 10 days after the first stage, with survival of the patient.

The authors believe that the use of a two-staged procedure would markedly reduce the operative mortality in pelvic exenteration.

—*Ely Elliott Lazarus, M.D.*

Results of Treatment in Uterine Carcinoma (Die Behandlungserfolge beim Uteruskarzinom). W. MÖBIUS. *Arch. Geschwulstforsch.*, 1955, 8: 1.

IN 1936 Heyman of Stockholm started the idea of grouping the results of treatment for carcinomatous lesions. More and more clinics have since joined this effort and made regular reports on their cases under treatment.

Of 87,424 patients with cancer of the cervix, 93.3 per cent were treated with a reported cure of 34.7 per cent. For the years 1943 to 1947, 38.3 per cent of 29,731 patients were reported to be cured.

Of 5,480 patients with endometrial cancer, 5,303 or 96.8 per cent, were intensively treated and 53 per cent were reported to be cured.

From 1937 to 1948, 2,203 patients with cervical carcinoma were treated either by surgery (34.4%) or with radiation (65.6%). The breakdown in stages is as follows:

Stage	*Surgery per cent*	*Radiation per cent*
1	24.5	17.4
2	9.3	29.1
3	0.5	17.1
4	(1 case)	2.1

The 5 year survival rate was 39.9 per cent and, the 10 year survival rate was 29.9 per cent. The carcinoma itself was the cause of death in about 43 per cent of the cases. Eighty-five per cent of the patients reported back to the clinic; the rest was seen either by the family physician or they sent in their reports themselves. The 5 year survival rate of 39.9 per cent is divided as 17.4 per cent for surgery and 22.5 per cent for radiation. The 10 year survival rate of 29.9 per cent gives credit to surgery for 13.2 per cent and to radiation for 16.7 per cent. The percentages for the different stages are as follows:

Stage	*5 Years Per cent*	*10 Years Per cent*
2	33.7	22.7
3	21.1 (*Practically all radiation therapy*).	
4	*Of 46, 3 are still alive after 5 years.*	

The war years with their undernutrition and difficulties of transportation certainly had some influence on the end results.

For carcinoma of the cervix the end results are summarized in the following table:

Surgery	*Cured*	*Radiation*	*Cured*	*Total*	*Cured*
Stage 1—540	303(56.1%)	383	206(53.9%)	923	509(55.1%)
Stage 2—206	80(38.8%)	639	205(32.1%)	845	285(33.7%)
Stage 3—11	1	378	81(21.4%)	389	82(21.1%)
Stage 4—1	0	45	3	46	3(6.5%)

Of 432 patients with corporeal cancer all were seen during the years 1937 to 1948 and 418 were treated. The average incidence of corporeal carcinoma to cervical carcinoma was 1 to 5.6. P. Schroeder classifies endometrial carcinoma in 4 groups: (1) only endometrial tissue is involved, (2) the myometrium is 50 per cent involved, (3) the myometrium is infiltrated to the serosa, and (4) distant metastases are present and the cancer has spread out of the uterine tissue.

From the surgical viewpoint another classification can be accepted: stage 1, the cancer being limited to the uterus, and stage 2 when the lesion has spread outside of the uterus. The latter stage is subdivided into group 1 if the lesion is thought to be operable, and group 2 if it is inoperable.

The survey reveals that 81.8 per cent of the cases were limited to the uterus, of which 60 per cent were operable and 21.8 per cent were inoperable. The 5 year survival rate of 418 patients was 56.2 per cent (235). The 10 year survival rate was 42.1 per cent (93). Three hundred and eleven patients (74.4%) were operated upon and 106 received radiation therapy; one patient received both types of treatment.

Of the 251 patients in stage 1, those in group 1 (62.2%) were still alive 5 years after surgery; of the 91 in stage 1, those in group 2 (52.2%) were still alive 5 years later. Of the 31 patients in stage 2, 40.8 per cent were still alive after 5 years. A third group of 46 patients with what is called pelvic carcinoma (generalized pelvic cancer of unknown origin) is presented. Thirty were treated but none survived 5 years.

For carcinoma of the uterine corpus the end results are summarized in the following table:

	Surgery No. of Cases	*Cured*	*Radiation*	*Cured*	*Total*	*Cured*
Limited to the uterus..	251	156 (62%)	91	48 (52.7%)	342	204 (59.7%)
Spread beyond the uterus..	60	0	16	0	76	31 (40.8%)

The author would like to see follow ups of the treated patients for 10 years after their initial treatment. —*Robert O. Verheecke, M.D.*

EXTERNAL GENITALIA

Vaginal Candidiasis; New Method of Diagnosis and Treatment. GISELLA PERL, ALAN F. GUTTMACHER, and HELENA JAKUBOWICZ. *Obst. Gyn.*, 1955, 5: 640.

THE AUTHORS present a clinical evaluation of treatment of the common vaginal monilia infection with a new product: gentersal cream (Ortho). The history of the classification of this fungus and the pathologic manifestations of the Candida family outside of the vaginalike thrush, mycotic carditis, bronchopulmonary candidiasis with secondary invasion are briefly reviewed. The theories explaining the increased pathogenicity of saprophytic Candida after antibiotic treatment—especially streptomycin medication in pulmonary tuberculosis—are discussed. Since Candida requires large amounts of sugar for cultivation, its pathologic growth during pregnancy and uncontrolled diabetes with their increased tissue glucose, and the premenstrual exacerbation of candida symptomatology are as well explained as its rare occurrence in children and in senile vaginitis. Of 103 patients in this series with vulvovaginitis due to Candida, 42 per cent were pregnant.

The symptoms of candidiasis in the order of frequency are: (1) pruritus, often leading to secondary scratch infection, (2) altered character of the vaginal discharge, drier, cheeselike, white, (3) with increased severity edema occurs with a fiery red vaginal mucosa that bleeds easily, (4) Dyspareunia, and (5) urinary frequency and dysuria. The clinical picture is less clear when the condition is associated with trichomonas, as it produces a more profuse and thinner, watery discharge.

The diagnosis is confirmed by smear and culture. Smears are quite satisfactory with gram stain or methylene blue, but cannot be relied upon if negative. The authors found the Nickerson medium (Ortho) with the active ingredient of a complex bismuth sulfite very satisfactory for cultures, and describe the procedure in detail. It is important to make sure that no vaginal medication has been used for 72 hours and that the culture is incubated at between 32 and 37 degrees C. so that results are available within 48 hours.

Gentersal cream contains 0.05 per cent gentian violet, which is supposed to block enzymes within the fungus cell, and a quaternary ammonium salt which penetrates deeply into skin structures and destroys Candida in a high dilution. Other advantages of this preparation are the effectiveness of much smaller amounts of gentian violet than are commonly used, and the absence of irritation and severe staining.

In 350 patients complaining of vulvovaginitis trichomonal, nonspecific, and senile types of infection were excluded. Of the remaining 40 per cent with positive cultures for Candida, 115 patients could be carefully followed up. These patients inserted the plastic plunger applicator with the medication intravaginally twice daily for at least 10 to 14 days, irrespective of menses. If one week after this course the culture was still positive—as frequently seen in pregnancy—the course was repeated. Douching and all other medication was disallowed. The patients were considered cured only after three successive negative cultures, each 2 weeks apart.

Forty-two of the patients were still undergoing treatment at the time of this report. The remaining 73 patients were cured, 70 per cent with one course of therapy only and in 4 cases with three and more courses. There were no known recurrences, 20 patients being followed up for at least 5 to 7 months. Five typical case reports are given to demonstrate the rapid elimination of symptoms and the absence of side effects. —*W. D. Bergman, M.D.*

A Case of Vulvovaginal Tuberculosis Involving the Uterus (Ein Fall von Vulva-Scheiden-Tuberkulose unter Mitleidenschaft der Gebærmutter). JOSÉ R. DEL SOL and F. NOGALES. *Geburtsh. & Frauenh.*, 1955, 15: 411.

THE AUTHORS have examined the reports of 350 cases of genital tuberculosis seen in the Women's Clinic at the University of Madrid. Only one case of vulvovaginal involvement was found in this group, an incidence of 0.3 per cent. This percentage is lower than other percentages of vulvovaginal involvement reported in the literature, which vary between 0.5 and 3.0 per cent of all genital tuberculosis. This was the only case of its kind among 13,000 gynecologic patients seen at that institution.

The 32-year-old patient sought medical help for vaginal discharge and a small ulceration of the vulva of 6 months' duration. At the age of 14 years she had had several febrile episodes, then called "gastric"; there was primary sterility after 4 years of marriage. On pelvic examination the ulcer showed a sharp edge and yellowish tenacious secretion over a coarsely granulated surface, and the lesion extended from the labium minus to the vaginal wall. There was also a large cervical erosion, resembling the ulcer in character; the uterus was not fully mobile, and the adnexae was slightly full and tender. Roentgen films of the lung showed evidence of old tuberculous processes with bilateral peribronchitis. Several biopsies, and dilatation and curettage revealed typical noncaseating tubercles of the vulva with secondary infection, proliferative tuberculosis of the cervix, and nodular tuberculosis of the endometrium.

The patient was treated with a combination of a salt of isonicotinic acid hydrazide (INH) with 0.5 gm. of dihydrostreptomycin every 12 hours, local medication of visible lesions with the same drug in 2 per cent solution, calcium, vitamin E, and bed rest. After a total of 40 gm. of the drug the cervical lesion had disappeared, after another 3 weeks curettage showed normal endometrium, and the external vulvar lesion was closed, dry, and scarred.

The authors believe that this case was obviously a secondary hematogenic manifestation after an old pulmonary tuberculosis, while not denying that a primary localization of tuberculosis in the genital organ is conceivable. The ports of entry into the fully involved genital organ were probably the tubes, as evidenced by the infertility. The excellent therapeutic result with the antibiotics described, particularly with

additional local medication, might make localized tuberculosis a curable disease.

—*W. D. Bergman, M.D.*

MISCELLANEOUS

Pelvic Arteriography in the Obstetricogynecological Field (L'arteriografia pelvica in campo ostetrico-ginecologico). UBALDO CASABONA and AURELIO TETTI. *Minerva gin.*, Tor., 1955, 7: 279.

TWENTY pelvic arteriographies have been carried out at the Obstetrico-Gynecologic Clinic of the University of Torino, Italy. They were all done by the original method of Dos Santos; in all instances the Italian product, joduron (water-soluble pyridone-di-iodate salt in 70 per cent strength), was employed and the serial roentgenograms were taken at intervals of two seconds. The reason for not taking these exposures at intervals of less than two seconds lies in the fact that no completely mechanical changer for such large films is available.

Serial arterioroentgenographic reproductions of the most successful cases are included in the original article. Unfortunately, these cannot be reproduced here, and the interested reader will have to be referred to the original text for their perusal. A glance at the roentgenographic reproductions gives the impression that such results, procured by hand manipulation of the injecting syringe and of the roentgenographic film material, would require a great deal of practice. One of the subjects was normal; one was a posthysterectomy case; two were gravid women.

On the whole, the technique seemed to follow closely that described by Leo J. Hartnett (*Am. J. Obst.*, 1948, 55: 940). The latter author, who was looking for disease, claimed to be able to demonstrate the presence of placenta previa. Other current techniques were discussed: that of Castellanos and Pereiras (retrograde aortography), consisting of the injection of the contrast material into the femoral artery; that of Fariñas, consisting of inserting a catheter upwards to the desired level from a puncture in the femoral artery; or modification of the Fariñas technique, described by Godwinn and associates, consisting of inserting this catheter through the opened lumen of a branch of the femoral artery (usually the lateral circumflex branch of the femoral artery). However, due to their complexity or difficulty of application, the authors did not consider them practicable for their work.

In discussing the so-called contraindications, such as renal and hepatic deficiencies, advanced pulmonary disease, grave hyperthyroidism, hypertension, incipient gangrene, hemophilic diathesis, and iodine sensitivity, the authors stress the fact that the contraindications should be judged on the basis of the clinical findings rather than on rigid laboratory procedures.

In discussing the diagnostic value of the procedure, the authors suggest division of the indications into those of obstetrics and those of gynecology. The major field in gynecology is, of course, the diagnosis of tumors. Whether or not the type of vascularization of gynecologic tumors will prove of pathognomonic significance in the diagnosis of these new growths (more especially the differentiation, as between benign and malignant tumors), is still considered an unproved thesis. The authors mention the value of doing a concurrent hysterosalpingography, particularly in the diagnosis of the size and location of uterine myomas, as described by Borell *et al.* (*Acta Radiol.*, Stockh., 1952, 58: 4), and the possible use of this combination in the detection of the concomitant presence of another tumor.

In obstetrical practice, in addition to early localization of the placenta, the method should be of value in distinguishing between the bleeding of placenta previa and extrauterine pregnancy. It should also be of value in the early recognition of vesicular mole and of distinguishing between this condition and chorionepithelioma. The authors' limited experience tends to confirm the findings of Hartnett that the method is harmless, even in the pregnant state, carrying risk for neither the mother nor the fetus. In pregnancy, the roentgenographic exposures should be limited to the least required; however, in the hands of experts the diagnosis of complex obstetrical conditions should be attempted with this method, which is always helpful and is without danger. —*John W. Brennan, M.D.*

Essential Dysmenorrhea (Dismenorreia essencial). A. DE CASTRO CALDAS. *Acta gyn. obst. hisp. lus.*, 1955, 4: 165.

THE PRESENT discussion is in the form of a lecture given before the Portuguese Society of Endocrinology, and is concerned chiefly with the treatment of essential dysmenorrhea. Of vital importance in the treatment are the etiology and pathogenesis.

Ever since the time of Hippocrates, the theories attempting to account for the pains in essential dysmenorrhea have pretty much reflected the progress of medical knowledge. Thus there was the theory of congenital hypoplasia of the uterus, reflecting the interest of the profession in embryology. When it was shown that only a small fraction of 1 per cent of dysmenorrheic patients gave any evidence of the presence of uterine hypoplasia, this theory was succeeded by the vascular theory (Novak); the meager vascularization of the poorly developed uterus was thought to result in its engorgement during the menstrual period with resulting pains. This theory was intended as an answer to some of the objections to the cervical blockage, or mechanical theory *ipso facto*. Nevertheless, the theory was unable to answer all such objections and the profession turned to the endocrine theory of the causation of essential dysmenorrhea. This conception led far afield; there was much discussion of the relative parts played by the estrogens, the luteinic hormone, and the gonadotropic hormone of the anterior lobe of the hypophysis.

The peculiar way in which many patients responded to these various hormone therapies led to the belief that there is a psychogenic component active in many instances of essential dysmenorrhea. This last theory is the one that seems most rigidly to focus the author's attention. He attacks this aspect of the problem in his daily practice in two ways. He has noted that most of these neurotic young women are evidently thin and under a severe form of stress in their living conditions; often they are anemic. He therefore attempts to correct their living habits by seeing that they get the proper food and that they get sufficient rest.

The author believes firmly in psychotherapy as the method of treatment of essential dysmenorrhea. He does not postulate, however, that every gynecologist and every practicing physician should apply the principles of psychoanalysis; much benefit can be procured for the sufferer by a process which may be designated an assuasive conditioning. The patient should be persuaded to continue her studies, and to indulge in light gymnastics during the menstrual period. Certainly she should be encouraged to persist with her ordinary habits of living. The instance is cited of the young women in the English Army during the World War, who were entrusted with such important duties that the consequent preoccupation with their tasks left no time for remembering the threat of their menstrual discomforts; while so employed, these patients largely forgot their ailments.

When such psychotherapeutic procedures, perhaps supplemented by minor medical measures (small doses of insulin, mild analgesic preparations) do not succeed in relieving the symptoms, there may be added periods of bed rest, perhaps with hot applications to the abdomen. Applications of diathermy may prove of value, or any measure which may tend to improve the pelvic circulation.

All this does not mean, however, that hormone therapy, or the blocking of the peri-uterine nervous plexuses (including the pre-sacral nerve-block) with injections of alcohol or novocain, or the newer employment of the anti-allergic preparations should be neglected. The prestige which some of these methods acquire among these neurotic sufferers will alone result in surprising cures, if by no other effect, at least by suggestion.

All in all the author admits that the ignorance of the profession with reference to the origin and pathogenesis of essential dysmenorrhea is monumental. For the perfection of our understanding of the socially so vital problem of essential dysmenorrhea there is still needed a vast amount of intensive work by the profession. —*John W. Brennan, M.D.*

Noncancerous Postmenopausal Metrorrhagia; Etiologic and Therapeutic Problems (Métrorragies post-ménopausiques non cancéreuses; problèmes étiologiques et thérapeutiques). R. Rouchy and H. Lamotte. *Rev. fr. gyn. obst.*, 1955, 50: 87.

Considering the presence of amenorrhea for a year as the definition of the postmenopausal state, the authors present 20 cases of uterine bleeding of benign origin. The pathologic findings are divided into ovarian, uterine, and undetermined types. One thecoma, an endometrioma, and a cyst the size of a 7 months' pregnancy constituted the ovarian lesions. There were 4 patients with leiomyoma, 2 with endometrial hyperplasia, and 8 patients with polyps. In 4 cases, no pathologic explanation for the bleeding could be given.

The uterine tumors and the nonfunctioning ovarian lesions provided no explanation for the metrorrhagia. The state of the endometrium and its vascular bed appears to be the most important factor in the etiology of postmenopausal bleeding. Arteriosclerosis, capillary fragility, varicosities, and neurovegatative activity may prove to be the cause of vascular breakdown with subsequent bleeding. A more frequent source of metrorrhagia is the functional reactivation of the endometrium by subclinical ovarian function and adrenal hormone activity. Prolonged estrogen stimulation is considered a possible factor in the development of endometrial cancer.

Because of the potential relationship of postmenopausal bleeding to hormone stimulation with its threat of malignant degeneration, the treatment of choice appears to be total hysterectomy with adnexal ablation. In the case of medically inoperable patients, close observation is vital.

—*George C. Lewis, Jr., M.D.*

Transition from the Mole to the Chorioepithelioma; Various Aspects (De la mola al corioepitelioma; algunos aspectos). A. Novo. *Acta gyn. obst. hisp. lus.*, 1953, 3: 338.

Although the series of chorioepitheliomas reported is small, sufficient material for the establishment of exact criteria for the diagnosis and treatment of this condition seems to be present. However, the statistical discrepancies among the various reports with reference to the frequency, and results of treatment, of this entity (if entity it may be called) force the conclusion that a unanimity of criteria in this matter is lacking. In particular, the so-called capriciousness of the characteristic of malignancy in this condition makes one doubt the entire statistical build-up of the subject.

It seems that the clinical criteria of malignancy do not answer the difficulties of the problem; the fact that the patient died does not necessarily mean that the cause of death was not due to hemorrhage and sepsis rather than to metastasis and malignant toxemia. Thus, since further criteria seem to be necessary, it is natural to turn to the histologic diagnosis of chorioepithelioma. This, when combined with the newer histochemical methods, would seem to offer a satisfactory way to judge the malignancy or benignancy of the condition encountered. However, there seems to be no single morphologic or chemical characteristic which will reliably distinguish between the malignant and the benignant forms of these hypertrophic processes of the trophoblast, or processes made up predominantly of cells which are similar to the Langhans cells of the normal placenta.

The difficulty is due to the fact that both localized and so-called metastatic processes with confusingly similar histologic characteristics are encountered; these processes are so similar as to cause experienced pathologists to classify them all under the rubric of chorioepithelioma, a condition with a definition which precludes the possibility of benignancy. Nevertheless, reports are constantly appearing that these primary tumors and metastatic deposits regress and, in fact, frequently disappear completely, and that the patient remains perfectly well thereafter. This, of course, throws the student right back to the beginning of the discussion, to the fact that the distinction between malignancy and benignity must depend, at least partly, on clinical criteria.

Many students of the subject have adopted an extremely pessimistic attitude, considering that any attempt at present to distinguish between the malignancy or benignancy of these findings leads in a vi-

cious circle to nowhere. The author, however, is not so pessimistic. He considers that these disappearing primary tumors and metastases, indeed recurrent tumors, are probably not chorioepitheliomas. He admits that the distinction between the true chorioepithelioma and the so-called transition forms between the nonmalignant and the malignant type of trophoblastic hypertrophy, or hyperplasia, is frequently a difficult matter. It is true that the true chorioepithelioma tends to present a solid mass of cells histologically; however, even the tendency to form structures resembling those of the placental chorionic villi, or degenerated simulations of these villi, does not absolutely rule out the presence of a true chorioepitheliomatous process, although the presence of such structures is rather characteristic of the transition forms. The secondary localizations of these transition forms are not called metastases by the author, but transportations.

These infiltrations and transportations of Langhans cell-like masses are assumed to be merely the normal developmental processes, or normal hypertrophic developments, of the normal trophoblastic nidation processes of the normal placenta which, somehow or other, do not stop with the termination of the process of nidation of the fertilized ovum but get into the blood vessels of the uterine wall and grow by contiguity, or are carried as embolic particles to other regions of the body. The processes then tend to regress with the normal cessation of the process of nidation. Thus, the evidences of regression, or degeneration, are seen to occur in the cells themselves and not in the surrounding tissues as in the case of the true malignant chorioepithelioma.

Here, then, appears to be a means of distinguishing between the malignant and the nonmalignant processes. The tissue specimen will depict the processes of degeneration, not in the tumor cells themselves, but in the muscle fibers of the uterus; this finding, in the author's opinion, postulates malignancy.

The author believes that the true chorioepithelioma is always malignant in development, and he considers, in view of the meager possibilities in its treatment, that it is indeed fortunate that the condition is so rare. He lays special stress on these transition forms (survival of trophoblastic cells, decidual endometritis, and vesicular mole) in the interest of avoiding unnecessarily radical procedures on young women, particularly nulliparas. In older women there is perhaps justification, when this difficulty in distinguishing the malignant from the benignant process develops, in proceeding at once to the sacrifice of the uterus and adnexa; however, in the younger patient there is justification in delaying such action for an intense study of the nature of the condition present. In the meantime, of course, every postabortal patient, particularly following the expulsion of a chorionic mole should be carefully watched, with perhaps the application of radium locally and roentgen irradiation regionally before resort to radical surgery. —*John W. Brennan, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Accidental Hemorrhage. J. K. FEENEY. *Irish J. M. Sc.*, 1955, 6th Ser., No. 353: 195.

FEENEY prefaces his article with a short but interesting historical note on the problem of accidental hemorrhage. The etiologic factors apparently are multiple; there are multiparity, anemia, malnutrition, toxemia, and other factors commonly encountered in association with this complication. The subsequent retroplacental bleeding leads to distention of the uterus initiating a uterorenal reflex resulting in arteriospasm, ischemia followed by albuminuria, oliguria, and eventually anuria. Secondly, retroplacental bleeding may result in the introduction of thromboplastin into the maternal blood stream with depletion of fibrinogen and the syndrome of hypofibrinogenemia. Shock out of proportion to the amount of bleeding is the third complication which may occur as the result of accidental hemorrhage. The author believes that this is probably of reflex origin.

Clinical data are presented from the Rotunda Hospital, National Hospital, and Coombes Lying-In Hospital over a 25-year period. The essential points in the data were summarized. The overall incidence was 1.1 per cent; the case mortality was 3.3 per cent. The incidence has increased in the last 5-year period and the mortality decreased probably on the basis of earlier recognition and hospitalization. The three hospitals had a total of 3,256 cases of premature separation of the placenta. There were 106 maternal deaths; 62 were due to hemorrhage, 25 to acute renal failure, and 8 were associated with convulsive toxemia. The fetal loss was 50 per cent.

One of the striking features was the marked increase of this complication among the multiparous patients. In one of the hospitals nearly 30 per cent of the cases occurred in grand multiparas. Nearly half the infants delivered were premature. In a review of the associated factors in one of the hospitals, cardiac disease was present in approximately 0.8 per cent. Hemoglobin was less than 10 gm. in 31 per cent. The incidence of breech presentation was 3.6 per cent. In approximately one-third of the cases toxemia was associated. In the remaining two-thirds there was no clear-cut association established. In this hospital the total mortality was 1.6 per cent, varying from 0.6 per cent in the mild and moderate disease of separation to 10 per cent in the severe cases.

Renal suppression occurred in 6½ per cent of all cases and in 20 per cent of the severe cases. A clotting defect was noted in 21 per cent of all cases, in 50 per cent of the moderately severe separations and in 92 per cent of the severe separations.

The treatment of this group of patients in general revealed that no active obstetric interference was carried out in 62 per cent. Rupture of the membranes was done in 30 per cent and cesarean section in 7 per cent. Nearly all of the patients subjected to cesarean section had the further complication of toxemia.

A very nice summary of management is given, as follows: (1) toxic accidental hemorrhage is an acute emergency requiring immediate hospitalization; (2) fundamental nursing care, often overlooked in an emergency, is essential; (3) pain and apprehension should be treated by morphine; (4) indwelling catheter; (5) clotting test and fibrinogen levels; (6) early administration of compatible blood; (7) the additional administration of fibrinogen when indicated; (8) rupture of membranes; (9) pituitrin and pitocin in small doses; (10) splanchnic block; (11) expectant vaginal delivery if the patient's general condition is improved, if the urinary output is 30 c.c. or more per hour, and if labor has begun; (12) obstetric intervention if external or internal bleeding continues, if shock worsens, if renal output is less than 30 c.c. per hour, if labor does not supervene, and if the patient is undelivered after 8 hours; (13) hysterectomy should not be done even in the presence of severe discoloration because of the danger of increased bleeding and the likely possibility that the uterus will recover; (14) in the presence of oliguria or anuria the institution of Bull's treatment; (15) correction of anemia following the acute episode; (16) early ambulation; and (17) close postpartum follow-up.

In the discussion, FRANKLIN was concerned primarily with animal experiments on the uterorenal and other reflexes. His experimental work was performed on the rabbit. Franklin and others found that uterorenal, uteroadrenal, vaginorenal, vesicorenal and intestinorenal reflexes may all cause reduction in renal cortical blood content. Reflexes are initiated by distention of the viscus concerned. In addition, uterine contractions following delivery were found to produce the same type of reflex. The receptor organs for the reflex are not known and presumably could be baroceptive or nociceptive or even chemoceptive (anoxia). The reflex consists of the vascular constriction in the renal-vascular system shunting a large part of the renal cortical blood flow as described by Trueta. An interesting observation was made by distending the distal portion of the rabbit vagina with a balloon, resulting in a reduction in the urine output and, when this was marked, albuminuria also occurred.

There appeared to be some individual differences in response of the animals which was classified as a constitutional factor. It was believed that the constitutional factor may indicate the total functioning renal tissue. The evidence further indicated that this constitutional factor is of significance in the nonpregnant state and during the first two-thirds of gestation. However, in the last third period of gestation there is a distinct difference noted, depending upon the amount of uterine distention present.

The second group of experiments consisted of noting the effects of blood, either individual doses or donors, when applied to certain body surfaces other than uterine and skeletal muscle. It was found that the application of blood to the peritoneum, the endo-

metrium, the pleura, the pericardium, as well as blood injected into the myometrium and skeletal muscles, evoked reaction called "haemax" characterized by renal ischemia and rapid, shallow respirations. These changes could be reversed by removal of the blood and, at least in one rabbit, changes were produced in the kidney suggestive of early and lower nephron nephrosis.

SOPHIAN believes that renal ischemia is the only current theory of anuria which is tenable. In addition he feels that a reflex explanation of renal ischemia is the only valid one at the present time. In his experimental work he was able to produce all grades of renal ischemia by electric stimulation of the renal nerves. Similar effects have been produced by Hoff, by the stimulation of the brains of cats. Cortical ischemia in turn produces certain renal pressor substances among which are renin, pherentasin, as well as other vaso-exciter and vasodilator substances. The deleterious effect of sodium chloride was likewise confirmed in the experiments.

The several unsolved problems were presented, such as the difference of myometrial tension in the primigravida and multipara, the possible effect of low uterine tonus in premature separation of the placenta, whether hypofibrinogenemia precedes or follows placental separation, and the role of Couvelaire uterus in the production of noxious chemical substances which might cause renal ischemia, shock, and death.

MOORE reviewed the recent literature on the problem of hypofibrinogenemia and discussed it in the light of 67 fatal cases of severe accidental hemorrhage. At autopsy half of these patients exhibited acute bilateral cortical necrosis, the remaining half had lesions which were considered to be less severe than those of renal cortical necrosis. It was pointed out that if Schneider's theory was correct there should be some relationship between the amount of thrombosis noted in the kidney and the incidence of postpartum hemorrhage. In these 67 cases, however, the opposite was found to be true.

In this study, as well as in that of Weiner, Reid and Roby, thrombi were not noted in the kidneys of patients dying in 8 to 12 hours after the onset of the complication. This suggests that fibrinogen depletion precedes the time at which the fibrin emboli are formed. Furthermore the lesions produced experimentally were considered to have only a superficial resemblance to those appearing in women dying from accidental hemorrhage.

In conclusion, the author expresses his belief that the theory of disseminate fibrin thrombi was not adequately supported by the evidence at hand.

—James F. Donnelly, M.D.

LABOR AND ITS COMPLICATIONS

The Problem of Cerebral Damage in Forceps Deliveries (Zur Frage der Gehirnschaedigung bei Zangenentbindung). HERBERT HEISS and HELLMUT LECHNER. *Geburts . & Frauenh.*, 1955, 15: 425.

WITH AN INCREASING NUMBER of forceps deliveries in European and American countries for wide maternal indications it should be expected that some type of damage to the fetal skull might occur in a significant number of cases. The fact that we cannot diagnose any lesions short of gross injury during the early infantile period when large areas of the infantile brain are neurologically mute does not mean that iatrogenic traumatic damage does not occur and that it might not be related to neuropsychiatric disturbances later in life, especially to the problem of epilepsy.

With the help of the electroencephalogram the authors set out to prove that there might be a way to provide evidence of damage of this kind. Fifteen term infants delivered by forceps for different indications (6 of them for threatened intrauterine asphyxia) had electroencephalograms on the fourth to sixth postpartum day, supposedly the optimal time to pick up significant changes. A six-channel 3-D instrument, sixteen electrodes as employed by the Hess Institute in Zurich, and a rubber cap were used to produce bipolar leads with electroencephalographic readings over 35 to 40 minutes. The interpretation of the results was blind by mixture with several normal controls.

In cases of uncomplicated low forceps delivery no significant changes could be discovered. After difficult forceps deliveries, however, deep transverse arrest, prolonged labor and, in infants born with the cord around the neck, distinct changes in the sense of mechanical circumscribed or generalized damage of the brain were found, with delta foci in the electroencephalograph and marked depression of cerebral activity. No definite pattern seemed to result from different maternal indications and conditions.

The authors plan to extend this study and to follow through with long term supervision of these children in order to find further pathologic patterns in later life that might be related to the artificial trauma of a forceps delivery. *—W. D. Bergman, M.D.*

Cesarean Sections at St. Louis Maternity Hospital from 1948 Through 1952. ARTHUR L. HASKINS, SETH E. WISSNER, and WILLARD M. ALLEN. *Am. J. Obst.*, 1955, 70: 70.

THE CESAREAN SECTION rate at St. Louis Maternity Hospital, St. Louis, Missouri, from 1948 to 1952 was 2.3 per cent. This was identical with the cesarean section rate from 1932 to 1937. There have been changes in indications for cesarean section. Medical conditions, postmaturity, and toxemia of pregnancy have occurred less frequently, as indications, and cephalopelvic disproportion, previous cesarean section, premature separation of the placenta, and placenta previa have increased in frequency. A comparison of currently accepted indications for cesarean section at this hospital with indications prevalent in other hospitals with cesarean section rates of 6 to 10 per cent revealed that the latter institutions had a greatly increased incidence of previous cesarean section and elderly nulliparas as reasons for cesarean section. Cephalopelvic disproportion as a primary indication for cesarean section occurred more frequently in the current St. Louis Maternity Hospital statistics than in statistics reported in the previously mentioned papers.

Despite the relatively low cesarean section rate at this hospital, the maternal mortality rate was 2.4 per 10,000 vaginal deliveries, and none in the cesarean

section deliveries. The maternal mortality in the 1932–1937 series at this hospital was 30 deaths per 10,000 vaginal deliveries. The cesarean section maternal mortality was 57 deaths per 10,000 cesarean sections. The perinatal fetal mortality has decreased from 4.6 per cent in the 1932–1937 series to 3.6 per cent in the current series. The perinatal mortality following cesarean section in the 1948–1952 series was 9.6 per cent as compared to the 5.8 per cent reported in the 1932–1937 series. This is the result of the change in indications for cesarean section in the current series, with many infants dead or compromised prior to the cesarean section.

Despite the use of various operative techniques and prophylactic antibiotics, the maternal morbidity in cesarean section patients was about five times that in deliveries of all types. There was no demonstrable decrease in maternal morbidity when the low transverse cervical cesarean section was used as compared to the morbidity following the use of the classical cesarean section. Maternal morbidity in cesarean sections preceded by labor was about twice that of cesarean sections not preceded by labor.

The neonatal fetal mortality in elective cesarean section because of previous cesarean section was 2.9 per cent as compared to the neonatal mortality in deliveries of all types of 1.5 per cent. Analysis of the fetal deaths that occurred in all types of deliveries demonstrated that cesarean section was indicated but not done in 2 per cent of the cases of fetal death. If cesarean section had been accomplished in these instances the cesarean section rate would have been increased from 2.3 to 2.4 per cent.

According to this analysis it is possible to practice good obstetrics with cesarean section rates equal to those reported 20 years ago and with a good result, as judged by maternal mortality and morbidity and fetal mortality. Cesarean section is an increased hazard to the mother and fetus and therefore the original conservatism lauded in earlier days is still a tenable concept.

PUERPERIUM AND ITS COMPLICATIONS

Manual Exploration of the Postpartum Uterus. SIMON DUCKMAN and PHILLIP DENNEN. *Obst. Gyn.*, 1955, 5: 628.

THE AUTHORS believe that manual exploration of the postpartum uterus will all but eliminate retained secundines as a cause of postpartum hemorrhage. It should be done in all cases of manual removal of the placenta, the slightest suspicion of an incomplete placenta, difficult delivery or labor, and all unexplained postpartum hemorrhage. Done with all these indications, never without a valid reason, and within minutes of the completion of the third stage of labor, severe blood loss with all its sequelae can be avoided very frequently and "uterine atony" will become a diagnosis of exclusion. The manipulation is also helpful in stimulating an empty uterus to contract, and in the diagnosis of incidental findings like myomas and congenital abnormalities of the genital tract.

Some papers, published as late as 1943, warned against this procedure because of its high morbidity, probably occurring mainly when the exploration was delayed too long and the blood loss was already excessive. There is, on the other hand, plentiful evidence to expect good results with early exploration of the uterus before the patient becomes anemic and infected.

In this series 83 manual explorations of the full term postpartum uterus were done after a total of 700 deliveries (=11.1 per cent). Thirty-two of these explorations followed manual removal of the placenta. Precautionary measures were antiseptic washing of the vulva and vagina with zephiran, and a change of gloves. Only 12 of the patients received some form of antibiotic or chemotherapy, mostly for reasons other than the invasion of the uterus. In 34 out of 42 cases in which the placenta was thought to be incomplete, no placental tissue was recovered. No case of retained placenta was missed in these 700 deliveries.

There was a morbidity of 2.0 per cent (2 patients) in this series of mostly private patients with manual exploration of the uterus. This figure compares very favorably with the 2.5 per cent morbidity for the entire obstetrical service in that hospital, and a 22.7 per cent morbidity in those patients who had to be readmitted later for excessive uterine bleeding. How far retained decidua can truly cause delayed postpartum hemorrhage, as postulated by some, cannot be decided at this time. But it seems wise to safely eliminate that cause of postpartum hemorrhage over which the obstetrician has some control.

—*W. D. Bergman, M.D.*

NEWBORN

The Etiology of Cerebral Palsy. NICHOLSON J. EASTMAN and MIGUEL DELEON. *Am. J. Obst.*, 1955, 69: 950.

THE HISTORICAL BACKGROUND concerning theories of the etiology of cerebral palsy are presented. The current preponderant opinion is that parturition, particularly obstetrical trauma, is an important causative agent of cerebral palsy.

The American Academy of Cerebral Palsy's etiologic classification indicates that prenatal factors are responsible for about 30 per cent of cases and that natal factors are responsible for another 30 per cent. Thus, some 60 per cent of all cases are attributable to obstetrical factors. Since all authorities agree that the disease rarely is hereditary, the implication is that its genesis stems from faulty environmental conditions operative between conception and birth. Postnatal factors, in the same classification, are thought to be responsible for less than 10 per cent of all cases, while in 30 per cent no specific causation can be demonstrated. However, although the list of obstetrical causes is a long one, it is based largely on presumptive evidence rather than specific documentation. Nonetheless, since perhaps 11,200 infants born each year in the United States will develop cerebral palsy, it behooves obstetricians to take a more intimate concern in the matter.

Ninety-six individuals with cerebral palsy who were born at the Johns Hopkins Hospital, Baltimore, were identified through Maryland institutions dealing with cerebral palsy. A control series of 11,195 infants born at the Johns Hopkins Hospital between 1945 and 1949 was analyzed in respect to the same complications en-

countered in the cerebral palsy series. Most of the infants with cerebral palsy were born during these years.

Forty-one per cent of the cerebral palsy group were considered to be in poor condition at birth compared with 2 per cent in the control group. The breathing time of the cerebral palsy series was also considerably longer than that of the controls. Further evidence that the cerebral palsy infants were gravely handicapped at birth is given by the fact that the average hospital stay of the 61 mature palsy infants was 15.1 days, compared with 5.3 days for the mature controls. The prolonged hospitalization was usually necessitated because of abnormal respiratory behavior, attacks of cyanosis, feeding difficulties, unexplained fever, and failure to gain weight. Only 5 infants had actual convulsions.

There appeared to be no relationship between the neurologic type of cerebral palsy and any particular obstetrical complication. Rh incompatibility did not appear to be a factor in any case.

Premature birth occurred in 35.4 per cent of the cerebral palsy cases, compared with the clinic incidence of 9.2 per cent. One-third of the premature births occurred with abruptio placentae or placenta previa. This is several times the usual clinic incidence. Prematurity per se and cerebral palsy appear to be related. Mothers with intrapartum fevers were 5 times as frequent, and babies with prolonged fever were 200 times more frequent in the cerebral palsy group, even after exclusion of cases of obvious trauma and infection, or of precipitate or prolonged labor. It is suggested that intrauterine infections may play a significant role in the etiology of cerebral palsy.

Anoxia consequent to placental separation may also be responsible for many cases, as suggested by the fact that 21.9 per cent of the patients had bleeding after the twentieth week, compared with 4.1 per cent of the controls. Fetal distress occurred in 12.5 per cent, compared with 3.5 per cent of the control series. Toxemia, postmaturity, and cesarean section incidences were not increased. Midforceps (6.3%) and breech deliveries (8.3%) were about 3 times as frequent among the cerebral palsy group, and indicate the role of trauma.

Malformations were recorded for 14.6 per cent of the cerebral palsy cases, compared with 3.8 per cent for the controls.

Only 18 of the 98 patients could be considered to have had a normal pregnancy and labor.

It is suggested that a cerebral palsy registry be established by the American Academy of Obstetrics and Gynecology, and that there be closer liaison between this organization and the American Academy of Cerebral Palsy. —*Alan Rubin, M.D.*

MISCELLANEOUS

Megaloblastic Anemia of Pregnancy and the Puerperium. J. Badenoch, Sheila T. Callender, J. R. Evans, A. L. Turnbull, and L. J. Witts. *Brit. M. J.*, 1955, 1: 1245.

Investigation of patients with megaloblastic anemia of pregnancy and the puerperium is handicapped by the urgency with which treatment must be carried out and by the tendency of the anemia to remit spontaneously after delivery. In the present observations on 9 patients, particular attention was directed to the detection of abnormalities of gastric secretion and defects of the absorption of fat, and labelled vitamin B_{12} from the intestine. There was no evidence of reduction in the secretion of intrinsic factor or in the absorption of fat in these patients.

The serum vitamin B_{12} levels were normal. In women treated before delivery, folic acid was more effective than vitamin B_{12}. Although an absolute deficiency of folic acid cannot be excluded, the anemia seems more likely to be due to resistance to the action of the hemopoietic factors than to deficiency.

—*John R. Wolff, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Hypertension Due to Renal Compression Resulting from Subcapsular Hematoma. WILLIAM J. ENGEL and IRVINE H. PAGE. *J. Urol.*, Balt., 1955, 73: 735.

IN 1939, BY WRAPPING cellophane about one of a dog's kidneys, which resulted in the formation of thick, dense scar tissue, Page produced an experimental hypertension. This did not result from compression of the renal artery, but rather from changes in intrarenal hemodynamics produced by the firm hull surface surrounding the parenchyma. Removal of the kidney resulted in return of the blood pressure to normal levels. The clinical counterpart of this hypertension might be found in organizing hematomas following perirenal hemorrhage resulting from accidental kidney damage. One case report is presented.

A 19-year-old boy was admitted to the hospital with hypertensive symptoms of 2 years' duration, with blood pressure readings ranging between 170/110 and 158/90. There was no history of a definite injury, but during an active high school football career, he frequently suffered pain and soreness in various locations.

In x-ray studies, the entire right kidney seemed to be covered with many linear streaks of calcification up to 5 mm. in width. Presacral oxygen insufflation indicated that these streaks were limited to the renal outline. There was prompt excretion of the dye on both sides in an excretory urogram, with flattening of the right kidney calyces, suggesting compression. A vascular responsive test with tetraethyl-ammonium produced a pattern similar to that seen in animals with experimental renal hypertension as distinct from the response produced in experimental neurogenic hypertension.

The kidney was exposed for nephrectomy and found to be completely surrounded by a hard, bonelike shell that extended all the way around to the hilus of the kidney, with no evidence of compression of the renal vessels. Section revealed a large subcapsular cyst with a firmly calcified wall. There was no demarcation between the renal cortex and medulla. There was subcapsular fibrosis, some scarred glomeruli, and thickened and hyalinized arterioles.

During the first week following nephrectomy the patient's blood pressure averaged 118/72. Follow-up examinations during the year since operation revealed normal levels with ranges of 100 to 130 systolic and 64 to 90 diastolic.

It is pointed out that not all perirenal hematomas produce hypertension. Extracapsular hemorrhage that has free retroperitoneal space in which to expand is less likely to produce renal compression than subcapsular hemorrhage. The possibility of the latter complication should be borne in mind and undue surgical trauma to the kidney and capsule avoided. Whenever possible it is advisable to perform operations without delivering the kidney into the incision.

—Allan K. Swersie, M.D.

Renal Vein Thrombosis in the Newborn. B. A. SMITH, JR. *J. Urol.*, Balt., 1955, 73: 765.

RENAL VEIN thrombosis in the newborn is a rarely diagnosed syndrome, more familiar to the pediatrician than to the urologist. It is characterized by a sudden onset of hematuria or anuria, shock, and the appearance of palpable lateral abdominal masses in an infant suffering from dehydration as a result of severe diarrheal disorder.

This dehydration superimposed upon the physiologic dehydration of the newborn promotes further concentration of the normally polycythemic status. Venous and capillary pressures are low in this period and with increased thromboplastin on bed rest, sludging is promoted. There is little agreement as to the veins first involved. The presence of thrombosis in the small or medium-sized veins is generally accepted upon the appearance of symptoms when the main vein is involved. Massive infarction, enlarging the kidney to two or three times its normal size, may occur. The organ assumes a reddish-purple color and a soft, mushy quality with the medulla involved first and most extensively. Some investigators have found organisms in the thrombi. Others report no notable infectious process in the vein walls when the lesion is of recent occurrence.

Involvement of the opposite kidney may be of similar origin or may occur by extension by the vena cava. In approximately half of the cases the condition will be unilateral. Pulmonary emboli are common.

Findings other than dehydration, shock, and lateral abdominal masses are opisthotonos, fever, the presence of red and white blood cells in the urine, albumin casts, and positive urine cultures. X-ray films show a mass and bowel displacement. Excretory urography may show no function on the involved side. Retrograde study may show only ureteral filling because of compression of the collecting system. The dye may, however, extravasate through the mushy kidney in irregular collections.

Treatment in unilateral cases at this time is nephrectomy, which is urgent when infection is present. Improvement is usually immediate and dramatic. Postoperatively, anticoagulant therapy would seem advisable as well as close attention to fluid and electrolyte balance.

The author presents the case report of a 13-day-old dehydrated baby with anorexia and projectile vomiting of 3 days' duration. There was a tender firm mass, the size of a baby's fist, in the right abdomen. The urine was pink and contained many blood cells. A barium enema excluded intussusception. An excretory urogram showed no definite dye excretion. Opisthotonos was present. Cystoscopy without anesthesia showed some bloody fluid from a catheter placed in the right ureter. A right ureteropyelogram showed blotchy extravasation of the dye through the parenchyma and medial displacement of the ureter. The bowel too was displaced medially.

Following stabilization of the patient with oxygen and blood, nephrectomy was performed. Recovery was uneventful.

The kidney was markedly enlarged, purplish red, soft, with small subcapsular hematomas. No thrombus was palpable in the vena cava. On microscopic examination all details were almost completely obliterated because of hemorrhagic necrosis. A fresh laminated thrombus completely occluded the renal vein and its principal branches. Gram stains revealed pleomorphic gram-negative rods in the kidney tissue and in the thrombus. —*Allan K. Swersie, M.D.*

BLADDER, URETHRA, AND PENIS

Further Studies on Absorption Through the Human Bladder. N. S. R. MALUF. *J. Urol.*, Balt., 1955, 73: 830.

THE AUTHOR presents a study on absorption through two intact bladders isolated by cutaneous ureterostomies for low ureteral obstruction in patients who had undergone abdominoperineal resections for carcinoma of the rectum. A similar study on one bladder was published by the same writer in 1953, at which time the details of the technique used were described.

Varied solutions of measured volume and electrolyte concentration were introduced into the bladder and, after a 4-hour lapse, were recovered and analyzed. The results were as follows:

After instillation of isotonic sodium chloride there was no appreciable absorption of sodium+chloride— and water. With the instillation of hypertonic sodium chloride, water entered into the bladder. The sodium+chloride—were absorbed.

Urea was absorbed appreciably through the bladder from a hypotonic solution. Dextrose is not appreciably absorbed through the bladder.

Water in volumes of 100 c.c. and 120 c.c. was recovered after 4 hours in 94 c.c. and 112 c.c. quantities, and showed very little absorption. This contrasts sharply with records of absorption of all of 150 c.c. of water introduced into the rectosigmoid in 3 hours (Annis, 1952) and absorption in 2 hours of 40 per cent of water and 52 per cent of the chloride from 300 c.c. of 0.9 per cent sodium chloride in a segment of right colon (Moore, 1953). In connection with these contrasting absorption reactions of the bladder and rectum, both derivatives of the cloaca, it is pointed out that the former viscus is lined with stratified cuboidal, apparently nonglandular cells, whereas the latter is lined with crypts of columnar, glandular cells.

Urokon was absorbed through the bladder from high concentration and yielded an excellent pyelogram. Iodine minus was absorbed from high concentration sodium iodide and a weak pyeloureterogram was obtained.

These data are all explicable by simple diffusion. —*Allan K. Swersie, M.D.*

Congenital Megalourethra. TOM E. NESBITT. *J. Urol.*, Balt., 1955, 73: 839.

THE AUTHOR reports a rare variation of urethral diverticulum in a male infant, which might well be termed megalourethra.

A one-month-old infant was admitted to the hospital with findings of tremendous dilatation of the penile shaft on attempts at voiding. The penis was C-shaped, 4 inches long and 3½ inches in circumference; a pin-point urethral meatus was present. Because of infected urine and a high blood urea, cystostomy was performed and the urethra dilated to F14.

At the age of 9 months the patient returned for surgical repair. Urethroscopic examination showed a tremendous saccular dilatation to within 2 cm. of the external sphincter. An encircling incision was made in the foreskin one-half cm. proximal to the coronal sulcus. The skin was undermined and peeled back to the base of the penis. The dilated urethra, covered only by a thin segment of subcutaneous tissue, was incised vertically from the external meatus to the bulb. The urethral lumen was disclosed to have a width of 6½ cm. Redundant lateral flaps were excised leaving a strip of normal urethra along the ventral surface, measuring 16 mm. in width. The margins of the strip were approximated over a catheter with submucosal, interrupted catgut sutures. It was found that the penile elongation was more apparent than real, since the dorsal concave surface was only 2 inches long as against 4 inches for the convex ventral surface representing the distended urethra. The corpora cavernosa had not been involved in the formation of this deformity and after excision of redundant penile skin and approximation of the free margin to the mucosal cuff, a normal sized penis was formed.

Several illustrations accompany a description of the technique employed.

—*Allan K. Swersie, M.D.*

GENITAL ORGANS

Treatment of Cancer of the Prostate (Zur Behandlung des Prostatakarzinoms). P. RICKLIN. *Helvet. chir. acta*, 1955, 22: 111.

ABOUT 5 PER CENT of all men over 50 years of age have prostatic cancer. In most instances the diagnosis is made too late for radical prostatectomy. Radical prostatectomy is possible in carefully selected cases and still yields the best chance for survival. In a series of 132 cases of radical perineal prostatectomy reported by Jewett, 39 per cent of the patients survived 5 years and 19 per cent survived 10 years after radical prostatectomy for cancer of the prostate. This operation, however, is not without its complications. In 100 cases that were carefully followed up postoperatively, 25 per cent of the patients developed urinary incontinence, 7 patients developed strictures or rectovesical fistulas, and 4 developed persistent perineal fistulas.

Castration and estrogenic hormone can inhibit the growth of prostatic cancer and thus prolong life and reduce pain from osseous metastases. Nesbit and Baum have shown that the survival results of combined treatment by castration and the use of estrogenic hormones are better than if either therapy is used alone. Prostatic cancer, however, may cease to be dependent on hormones, The worth of cortisone therapy, hypophysectomy, and bilateral adrenalectomy still remain to be evaluated.

The author has analyzed a series of 108 cases of prostatic cancer observed between the years 1944 and 1954. The youngest patient was 48 years of age and the oldest 86. The average age at which a diagnosis of prostatic cancer was established was 69.5 years. Of the 108 patients 22 are still alive and 86 are dead. In a number of patients the presence of prostatic cancer could not be established on the basis of rectal examination. Biopsy of the prostate obtained by the transurethral or perineal route and the finding of an elevated acid phosphatase were often necessary to establish the diagnosis. The serum acid phosphatase level is apt to be elevated in 10 to 30 per cent of the patients with prostatic cancer who have no metastases, and in 65 to 75 per cent of the patients in whom metastases are present. Osseous metastases of prostatic cancer may cause considerable elevation of the serum alkaline phosphatase as well.

Transurethral resection of obstructing tissue was performed once in 32 patients and twice in 4 patients. Forty patients were subjected to prostatectomy. Since 1946 the author has favored retropubic prostatectomy over the perineal or transvesical method. There were 2 postoperative deaths. The average survival after orchiectomy was 3.5 years.

The results of hormonal therapy in the present series were similar to those reported by others. In 57 cases the average survival time after orchiectomy was 27 months. Forty-five patients were treated with estrogenic hormones only. In this group the average survival was 19.2 months. Estrogenic therapy was entirely ineffective in 16.8 per cent. In only 3 patients could the regression of osseous metastases be demonstrated roentgenologically. The author concludes that antiandrogenic therapy is of distinct value in the treatment of prostatic cancer. It is essentially a palliative form of therapy which fails entirely in 15 to 20 per cent. Surgery almost doubles the survival period of hormonal therapy but is applicable only to about 5 per cent of the patients.

—*S. Richard Muellner, M.D.*

Estrogen Therapy in Carcinoma of the Prostate. G. Birke, C. Franksson and L. O. Plantin. *Acta chir. scand.*, 1955, 109: 1.

The purpose of this investigation was to discover the lowest dose of estrogens that would produce total inhibition of the testicular production of androgens. A low dose of 5 mgm. of stilbesterol, then a large one (30 mgm.) was tried, and lastly an attempt was made to determine the optimal dose to prescribe for patients with prostatic cancer.

In a series of patients with cancer of the prostate who had been treated with varying doses of stilbesterol, i.e., 5 to 30 mgm., the excretion of the "androgen metabolites" was studied by chromatographic separation of the 17-ketosteroids and identification was made by means of infrared spectography.

The androgens of the male are produced by the testicles and adrenals. The testicular production is regulated by the pituitary gonadotropin. The adrenal production is governed also by the hypophysis. Estrogens administered to the organism inhibit the hypophysial production of gonadotropin and this in turn reduces the testicular production of testosterone. The administration of estrogens to patients with prostatic cancer who have intact testicles is, therefore, of clinical importance. However, the dose that produces total inhibition of the testicular production of testosterone has not been previously determined.

In planning treatment of the individual case, it should be determined whether the patient has androgen-producing testicles. If so, then estrogen therapy and castration can be expected to have a therapeutic effect. If not, it may be a waste of time to try this type of therapy. The effect of various doses on the excretion of "androgen metabolites" was compared with that of castration for the purpose of determining the dose of stilbesterol that causes total inhibition of the testicular production of androgens. The authors reached the following conclusions:

1. The administration of 30 mgm. of stilbesterol daily for 5 days completely inhibited the androgen production of the testicles.

2. An equivalent effect was produced by stilbesterol treatment for 15 to 20 days in doses of both 10 and 15 mgm.

3. Treatment of short duration with 5 mgm. of stilbesterol did not suffice to abolish the testicular production of androgens, but prolonged treatment with that dose seemed to provide a satisfactory result.

4. Attention is drawn to the importance of evaluating the testicular function and the results of therapy by checking the excretion of steroids.

5. Stilbesterol therapy has no effect on the excretion of steroids from the adrenals in castrated patients.

6. In the treatment with stilbesterol of patients suffering from prostatic cancer, the following doses as a result of this study are prescribed:

An initial dose of 10 mgm. of stilbesterol daily, which probably can later be reduced to 5 mgm. daily.

—*Conrad A. Kuehn, M.D.*

Studies on Fluid Absorption During Transurethral Prostatic Resection. Robert S. Hagstrom. *J. Urol.*, Balt., 1955, 73: 852.

It has been demonstrated to everyone's satisfaction that during transurethral prostatic resection, a certain amount of the irrigating fluid passed directly into the prostatic veins. Since many patients are subjected to this form of prostatectomy solely because their cardiovascular status is precarious, the rapid accumulation of too much fluid might well be disastrous. The object of this study was to determine the amount of fluid absorbed in relation to the amount of tissue removed and the time spent in resection.

A simple and logical method to measure fluid absorption would be to determine the postoperative blood levels of glycine or other substances commonly used to establish isotonicity of the irrigating fluid. However, this is not satisfactory since these are frequently rapidly metabolized and the serum level determinations are very difficult. The determinations therefore were made on a basis of careful weighing of the patient before and after surgery, making allowance for administration of intravenous fluids during the procedure, the amount of tissue removed, and the blood loss.

Graphs are presented from a study of 16 cases which plot the amount of fluid absorbed (as weight

gain) against the factors of resection time, amount of tissue removed, and the blood loss. The correlation in resection time was good with most cases falling within a range of 10 to 30 c.c. of fluid absorbed per minute. The correlation was poor in the plotting against the amount of tissue removed, with variations from 6 to 120 c.c. of fluid absorbed per gram of tissue. The variation in the relation to blood loss ranged from 5 to 38 c.c. of absorbed fluid per cubic centimeter of blood loss. A detailed method of estimating the blood loss is presented.

As a control study, determinations of fluid absorbed in prolonged procedures on 2 patients with bladder tumors treated by fulguration show no significant changes.

An illustrative case is presented. The patient was an elderly man with chronic heart disease suffering with salt depletion due to diet. During resection he experienced coma, cyanosis, and hypertension. This was believed due to further dilution of the pre-existing hyponatremia by fluid absorption, estimated to be 1,000 c.c. Besides causing overloading of the vascular system, this further reduced the low sodium serum level. The actual process was believed to be cerebral edema and increased intracranial pressure caused by the extreme hypotonicity of the extracellular fluid which loses water to the cells. Dramatic improvement followed the administration of 5 per cent sodium chloride. It is suggested that the serum electrolytes be checked in patients with a history of chronic salt depletion so that low values may be corrected prior to surgery.

—*Allan K. Swersie, M.D.*

Transvesical Prostatectomy with Primary and Total Closure of the Bladder; Considerations with Reference to 200 Cases (La prostatectomia transvesical con cierre primitivo y completo de vejiga; consideraciones sobre 200 casos). ANTONIO VALVERDE MAZUELAS. *Arch. españ. urol.*, 1954, 10: 248.

TWO HUNDRED PROSTATECTOMIES, performed in the period between November, 1949 and October, 1953, are here reported. These operations were all performed by the special technique used on the author's service at the Provincial Hospital in Madrid.

The technique described resembles a simplification of the current methods more than a modification. Through the usual midline suprapubic incision the prevesical space is exposed and carefully freed of fatty tissues. The space of Retzius is not invaded. The bladder wall is punctured with a coarse aspirating trocar and the opening is widened by a two-bladed and then a three-bladed separator to produce an operative aperture of sufficient caliber for the operation. At no time is a knife or a scissors used.

The enucleation of the prostatic adenoma is initiated at its anterior end and is accomplished by the finger of the operator. The enucleating finger is clothed in a rubber glove. The finding of the proper plane of cleavage may be greatly facilitated with a finger of the other hand inserted into the rectum. Of course, the separators of the abdominal wound are removed before the enucleation procedure is initiated. If, now, some portions of the adenoma do not come away with the rest and are not easily enucleable with the blunt finger tip, they are left until the separators have been reapplied, then grasped (under direct control of the eye) by means of a strong curved hemostat, and cut away with a scissors. At no point is strong traction employed on the posterior end of the tumor, principally in order to avoid the possibility of tearing the muscle fibers of the internal sphincter. Finally, some trimming of the edges of the mouth of the bladder may be done with a scissors.

From most of the cavity left by the enucleation any bleeding may be disregarded; it is only the posterior edge where the vessels come forward from the region of the trigone that a vascular toilet may have to be carried out. Here the author has used electrocoagulation; however, in the future he intends to do a simple ligation of the bleeding vessels. A proper-sized urethral catheter, which is always inserted and left in place for a period of a few hours, and exceptionally, for several days, or, again exceptionally, for periods of 20 days or more, will usually take care of any bleeding coming from the anterior end of the prostatic blood supply. The author doubts the existence of the posterolateral vascular pedicle which has been described by some writers, as in his experience the bleeding from this region has not seemed sufficiently severe to justify such a postulation. In the above connection the author wonders if a too long indwelling of the urethral catheter might not result in infectious or pressure changes in the external sphincter which could have a part in the causation of postprostatectomy urinary incontinence.

No further attention is given to the bleeding; the tobacco-pouch (circular) suture, which was applied early in the technique, is now drawn tightly, the bladder mucosa is inverted, and the bladder opening is closed. The whole may then be buried with an additional suture-in-Z. Penicillin (200,000 Oxford units) is placed in the region of the space of Retzius and the abdominal wall is closed in layers as per the usual technique with U sutures. The entire operation should not require more than 20 minutes.

The immediate results were surprisingly good. Nine patients died during the postoperative period (4.5 per cent). Four deaths were ascribed to uremia; 2 immediate postoperative deaths occurred in patients with carcinoma. Eighty-six per cent of the patients had immediate and complete relief; 7.5 per cent were benefited, that is, they had one of the three grades of incontinence (grade 1—total incontinence; grade 2—orthostatic incontinence; grade 3—incontinence on physical exertion or stress); and 2 per cent were not benefited, that is, they had total urinary incontinence.

Since 1953 the author's service has been conducting a follow-up campaign. Of the 191 patients surviving the operation, 142 could be traced. This revisal of the material at periods of from a few months to 5 years after the operation shows that there were total cures in 89.43 per cent of the patients; beneficial results in 5.63 per cent; no benefit in 2 per cent, and death in 4.5 per cent. These results are better than expected and are ascribed to the simplicity of the technique, the diminution of shock, and the shortening of the period of use of the indwelling catheter. The technique here described resulted in a minimum of postoperative care of the patient and seems to have eventuated in a minimum of complications. —*John W. Brennan, M.D.*

General Considerations of Tumors of the Testicle (Considérations générales sur les tumeurs du testicule). ALFONSO DE LA PENA. *J. urol. méd.*, Par., 1955, 60: 899.

THE AUTHOR has found few subjects in medicine more interesting or complex than tumors of the testicle. M. Chevassu in 1906 assembled the first collection of testicular tumors and established the first classification. He gave the name of "seminoma" to a group of these cancers.

A painless enlargement of the testicle is usually self-discovered, so the earliest recognition of the tumor may be lost. This cancer appears in the young male at the height of his physical and sexual activity.

The ability of these tumors to metastasize so rapidly, as well as the fact that treatment is associated with genital mutilation, suggest that testicular neoplasms merit special attention of the internist, surgeon, and urologist.

Because of the rarity of these cancers one clinician does not usually see enough of these cases to become familiar with the histopathologic diagnosis. It is only through the collected cases in the literature, such as a review of 80 cases with their histopathologic sections by Broders from the Mayo Clinic, that de la Pena has been able to enlarge his knowledge of this subject. In addition, the cases collected as a result of the World War have made it possible to acquire a more exact nosologic concept of the disease.

The author makes no attempt to classify these cancers, except to state that these tumors all arise from the testicle; that is to say, they are specific to this organ. These tumors, giving birth to distant metastases, follow the general laws clinically and histologically of cancers without having the peculiarities of specific tumors. Testicular tumors are not common, for in general they comprise 3.29 per hundred of all urological tumors and 2.09 per cent of those of man.

In Europe, the statistical studies are not as extensive as those in America, nor are they as conclusive. In Spain, several reports have been published; 16 cases were collected by Navarro, and Oliva de Valdecilla assembled 14 case reports from several urologists. It would seem that there does not appear to be any racial predisposition to testicular tumors.

Although neoplasms of the testicle have been reported in all age groups, 68 per cent appeared between the ages of 20 and 30 years, and 27 per cent between the ages of 30 and 40; the ages recorded for the appearance of this type of cancer ranged between 4 months and 82 years.

These tumors are usually unilateral, but it is not rare to find reported cases of cancer developing simultaneously in both testicles, or cases with a delay of several years before the appearance of a tumor in the remaining testicle. From the literature more than 156 cases of bilateral testicular tumor have been recorded. Hamilton and Gilbert in 7,000 reports found 134 cases of bilateral tumor formation, and they confirmed the fact that there is a five times greater carcinogenic predisposition in the man who has a testicular tumor to develop a second tumor than such a disposition in an individual who has not developed testicular neoplasm. The danger of development of this type of cancer is greater in individuals who have some degree of ectopia.

Among the predisposing causes for this neoplasm is trauma. The author cites a case of the development of a tumor following the fall from a bicycle. An enlargement of the scrotum had existed for 2 months following this accident when a cancer was discovered on surgical exploration. It is frequently noted there is a history of direct trauma to the gland, following which the tumor is recognized. Perhaps the trauma speeds up the recognition of a previously existing tumor. The relationship to biochemical irritants is doubtful. Cases of the appearance of testicular tumors secondary to tuberculosis have been reported.

Pelot and Hebrard collected 3 cases of atrophy of the testicle following mumps orchitis and 2 other cases of atrophic testicles in which tumors developed. They are of the opinion that atrophy of the testicle predisposes to tumor formation.

Considerable discussion ranges around the increased incidence of tumor formation in ectopic testicles. The author of this article reviews the various percentages compiled to show that the development of cancer in the ectopic testicle is increased over that in the normally placed organ. However, in his own collection of cases of 62 ectopic testicles, he did not find a case of testicular tumor, while he did find 11 cancers in normally placed testicles. He feels that the abnormally placed testicle does not have any special carcinogenic potential. However, the morphological and endocrine abnormalities coincident with this implantation may have some latent carcinoplastic properties.

With the exception of the case reported by Muto, the author has no knowledge of testicular neoplasm developing in a pseudohermaphrodite.

—*Conrad A. Kuehn, M.D.*

MISCELLANEOUS

The Surgical Pathology of "Essential" Hypertension in the Light of Newer Experiences and Its Consequences (Die chirurgische Pathologie des "essentiellen" Hochdrucks im Lichte neuer Erfahrungen und ihre Konsequenzen). R. CHWALLA. *Zschr. Urol.*, 1955, 48: 202.

THE INFORMATION derived from 494 autopsies on hypertensive subjects is here considered. The material consisted of 207 males and 287 females. In 34 per cent of these cadavers there were present urologic conditions which may have had a part in the etiologic background of the increased blood pressure. This 34 per cent consisted of prostatic hypertrophy (25%), sphincter rigidity or primary rigidity of the bladder neck (1.4 %) diffuse prostatic hyperplasia (2%), renal cysts (3.3%), renal hypernephromas (1.7%), and renal adenomas (0.67%). All these conditions had run their course during the life of the individual without producing symptoms of sufficient severity to demand intervention.

When the 31.3 per cent of cases of hyperplasia of the suprarenal glands is added, which could all have been corrected operatively, the author estimates that at least 20 per cent of all instances of "essential" hypertension is curable. The reasons that the author believes these conditions are concerned in the causation of this hypertensive state would be too many for a brief abstract; moreover, most of the opinions here expressed will be found in a modern treatise on this

subject by W. Raab (*Hormonal and Neurogenic Vascular Disorders*. Baltimore: Williams & Wilkins Co., 1953.) Suffice it to say here that the author considers these conditions to be involved in the causation of these instances of hypertension and adduces evidence for his belief. In fact, the figures here given are surprisingly close to the corresponding figures published by many other workers in many other lands.

The lesson to be drawn from this is, in the author's opinion, that the task of treatment of essential hypertension is too onerous for the internist alone. When he must admit the unsolved quandary inherent in the diagnosis of "essential" hypertension, it is time to call in the urologist, and when the urologist is unable to find any cause for the increased blood pressure, the attention of the diagnostician should be concentrated on the suprarenal glands. The only justification for the overlooking of these simple and reasonable proposals would lie in the fact that the condition has already advanced so far (nephrosclerosis) as to render any hope of ameliorative therapy illusory. Thus, in these patients with so-called essential hypertension the diagnosis should be established as early as possible.

Finally, the author voices the warning that, although the part of the higher centers of the nervous system in the causation of hypertension is not yet clarified, in long-continued essential hypertension the suprarenal glands are always involved, and therefore the administration of ACTH or hormones of the anterior lobe of the hypophysis will always be harmful to the patient (Selye, F. L., "Stress" 1950, *Acta Inc.*, Montreal). —*John W. Brennan, M.D.*

The Treatment of Acute Uremia. WALTER A. KEITZER. *J. Urol.*, Balt., 1955, 73: 921.

OLIGURIA or anuria that has been present for several days results in renal insufficiency which is manifested by a preuremic phase (reflected in chemical blood tests), followed by a uremic phase (clinical acute uremia). The etiologic agents are classified in three major groups: (1) obstructive uropathies; (2) fluid and electrolyte imbalances; (3) intrinsic renal lesions.

Acute uremia secondary to obstructive uropathies is treated by relief of the obstruction. Two representative cases are presented.

Acute uremia secondary to fluid and electrolyte imbalances is a disease primarily of some organ other than the kidney, with a resulting renal insufficiency. The degenerative changes that occur in the renal parenchyma may force the patient into the third group (intrinsic renal lesions) if the underlying primary condition goes untreated. In many instances such a condition is fatal.

Although the pathologic processes may differ, all the intrinsic renal lesions (circulatory, nephrotoxic, glomerulotubular) are characterized by acute renal failure, and by the ability of the kidneys to regenerate and function again, provided the patient lives long enough for this to take place.

The prevention of acute uremia from intrinsic renal lesions of circulatory origin demands the vigorous treatment of shock associated with hemorrhage. Whole blood and plasma expanders are recommended. Alkalinization with intravenous sodium bicarbonate is recommended in cases of reactions to mismatched transfusions.

The sulfa drugs, carbon tetrachloride, bichloride of mercury, arsenic, and gold may be nephrotoxic agents. The heavy metals require the immediate use of BAL in adequate dosage. Acute anuria due to phenobarbitals, aspirin, and bromides can be treated by dialysis.

Restriction of fluids, reduction of nitrogen catabolism, and maintenance of electrolyte balance are imperative in the preuremic phase. Fluids should be limited to 800 c.c. plus the previous 24 hour total fluid output. Oral fluids or parenteral 10 per cent glucose in water is recommended. An inlying urethral catheter is essential. Daily weight determinations, to detect increases due to fluids, is helpful. A diet, high in carbohydrates and fat, low in protein, salt, and potassium is carefully controlled. Cortisone is contraindicated. Testosterone, 50 mgm. daily, helps nitrogen balance. Antibiotics should be used to control infection.

Three to 5 per cent sodium bicarbonate for rapid response, or 1/6 molar lactate for more gradual response, is indicated when the carbon dioxide combining power falls below 20 volumes per cent.

Hyperpotassemia, the cause of the majority of deaths from cardiac standstill, may be combated with intravenous glucose with or without insulin, one unit per 3 gm. of glucose; continuous slow intravenous calcium gluconate; intravenous normal saline but not continuous; and digitalis. If sodium is low, careful replacement may help to combat excess potassium. Anemia is disregarded unless the blood count falls below 2 million, then only small transfusions of freshly drawn blood or washed packed red cells should be given.

The uremic phase, characterized by abdominal distention, vomiting, hiccups, hyperactive muscles with intermittent twitchings and jerkings, occasional carpopedal spasm, mental confusion, coma, and cyanosis occurs between the third and twelfth day of acute renal failure. Chances of survival are then less than 50 per cent. Artificial dialysis should be done before clinical uremia has occurred. Using the modified Skeggs-Leonards artificial kidney, blood urea nitrogen can be reduced 40 mgm. per cent per hour. A representative case is presented.

During the diuretic phase, nitrogen wastes continue to accumulate while varying amounts of electrolytes are lost. The 24 hour output of salt and potassium is measured and replaced the following day.

—*Ray C. Johnston, M.D.*

Observations on the Surgical Treatment of Urinary Tuberculosis (Remarques sur le traitement chirurgical de la tuberculose urinaire). ROBERT GUTIERREZ. *J. urol. méd.*, Par., 1954, 60: 847.

THE PROBLEMS associated with tuberculosis of the urinary system have been changed with the appearance of the antibiotics, for they have altered the pathology of this disease as well as its prognosis and surgical treatment. With the introduction of the antibiotics, great progress certainly has been accomplished in the medical treatment of renal tuberculosis. Nevertheless, the early recognition of the disease with early nephrectomy as conceived by Albarran is always desirable but is seldom achieved. For today it is important to make a distinction between the group of cases of reno-

ureteral medical tuberculosis (closed) and the group of cases of renoureteral surgical tuberculosis (open). While the treatment with streptomycin causes amelioration of symptoms and the patient is thought to be cured, with disappearance of the tubercle bacillus in the urine, the author believes that the treatment with the antibiotics does not always arrest the disease and cause a permanent cure. Urological study reveals noncicatrization of the renal lesions, and a surgical approach may be needed. It may be necessary to remove the kidney as well as the ureter if it is involved and continue the treatment with antibiotics after surgery.

In order to know what procedure to follow from the clinical and therapeutic points of view of the tuberculous kidney and ureter, the problem should be considered from three viewpoints; i.e., before nephrectomy, after nephrectomy, and the patient with the solitary kidney.

The author has manualized the usual therapeutic procedures before nephrectomy. These methods follow the established present day procedures, such as the medical treatment with antibiotics, nephrectomy when medical therapy is not effective, and the various conservative surgical procedures on the kidney and the ureter.

After nephrectomy, the ureter must be considered. Various conservative procedures have been advised to drain the stump of the ureter as well as cystoscopic fulguration, catheterization, and meatotomy to treat the remaining ureter. When the ureteral stump does not respond to conservative therapy, it may be necessary (if the ureter has not already been brought out to the skin) to remove the ureter and a suitable portion of the bladder. Endoscopic resection of the bladder neck may also be found to be necessary for postnephrectomy treatment. Several treatment procedures may be considered when the patient has a solitary kidney with pyeloureterovesical tuberculosis, viz.:

1. Plastic resection for the attendant hydronephrosis
2. Pyeloureteral anastomosis
3. Pyelostomy
4. Nephrostomy
5. Ureterostomy
6. Implantation of the ureter into the skin
7. Ureterointestinal implantation
8. Plastic operation, intravesical or extravesical, on the inferior extremity of the ureter.
9. Ureterointestinal implantation following total cystectomy.

In a review of 450 surgical cases, the author tabulated 23 different procedures for the treatment of tuberculosis of the kidney, ureter, and bladder. Prior to surgery, antibiotic therapy is recommended as well as postoperative medical and sanatoria treatment. The basic treatment regimen consists of the use of the "combiotics" that contain 5 gm. of dihydrostreptomycin and 400,000 units of penicillin in 2 cm. of solution, the patient receiving 2 cm. twice a day 2 weeks before operation and 2 or 3 weeks after operation. The treatment is augmented after operation by the administration of either a combination of three sulfanilamides (sulfadiazine, sulfathiazole, and sulfamerazine), aureomycin, terramycin, or acromycin. While the patients leave the hospital in good general condition, with clear urine and without the symptoms of cystitis, and with a healed incision, the treatment may have to be modified by the toxicity of the medication and the intolerance to the drugs.

After the patient leaves the hospital, the intermittent treatment is prescribed which consists of clinical, bacteriological, and roentgenographic observation for 6 months to a year; streptomycin is given two times a week, 3 gm. of para-aminosalicylic acid (PAS) are given four times a day, and 150 mgm. of izoniazide are given two times a day. This regimen is well tolerated, but if the pyuria persists after a year, it is well to continue the treatment until the urine becomes microscopically clear.

This therapeutic regimen is used in all cases of surgical intervention for urological tuberculosis as well as in cases of inoperable bilateral renal tuberculosis. The treatment is also combined with vitamin therapy, heliotherapy, suralimentation, and prolonged rest, preferably in a sanitorium.

The usual surgical treatment for the patient with renal tuberculosis and an uninvolved ureter is nephrectomy. In the New York hospitals the cases of nephrectomy are less numerous, but in spite of the present treatment with antibiotics, many cases of "open" renal tuberculosis that require nephrectomy for cure still remain.

In the cases in which the ureter as well as the kidney is involved, it is advisable to do ureteronephrectomy or nephroureterectomy. In performing nephroureterectomy, the two incisions are preferred by Gutierrez rather than one long incision, for they are less traumatizing. He does not recommend the implantation of the remaining portion of the ureter into the skin, for in most cases it becomes necessary to do a secondary ureterectomy to close a lumbar fistula or to cure the attending cystitis. It may also be necessary to remove a portion of the trigone that is involved when this portion of the bladder is infiltrated.

Cystoscopic fulguration of the vesical and meatal lesion may be very effective after nephrectomy to cure the tuberculous cystitis. In some cases in which the tuberculous lesions are isolated to a calyx or small portion of the kidney a partial resection may be done. This operation can be done when it has been determined that the renal pedicle and the vascular supply will permit this conservative procedure.

In certain advanced cases of tuberculous pyonephrosis with sepsis, intoxication, and poor general health, it may be preferable to do a two-stage operation—a nephrostomy, not only to drain the multiple tuberculous cavities, but also to drain perinephritic and paranephritic, or even accompanying subdiaphragmatic, abscesses. After a period of 2 or 3 weeks of nephrostomy drainage following which there is generally an improvement in the patients' health, a nephrectomy or a nephroureterectomy may safely be done.

Two groups of conservative plastic operations on the ureter in order to save the kidney must be considered. These lesions have resulted from the tuberculous process involving the ureteropelvic junction and the lower portion of the ureter. In the first group of cases the superior portion of the ureter has become stenosed, either intrinsically or extrinsically. These

plastic procedures are similar to the usual ones that are practiced for the nontuberculous hydronephroses.

For the second type of ureteral stenosis and stricture resulting from the tuberculous process the procedures are resolved into three categories:

1. The extravesical operations on the ureter that are associated with extravesical or intravesical lesions.

2. The operation on the ureter that is done to relieve the stenosis which has resulted from the extravesical compression of the iliolymphatic glands, and the operations done to remove fibrous adhesions from pelvic or appendical abscesses that have interfered with the normal dynamics of the ureter.

3. Operative procedures on the ureter to relieve stenotic infiltration in the wall of the ureter, and on the hydroureter.

These surgical procedures on the ureter should be planned for the individual case and should include resection of the strictured portion of the ureter as well as resection of the involved portion of the bladder and ureter, with reimplantation of the ureter into the uninvolved bladder portion. The author warns that reimplantation of the ureter into the bladder does not always meet with success, for this type of surgery may well be followed by ureteral reflux that causes the formation of a hydroureter and hydronephrosis. When conservative operations on the ureter fail, then nephroureterectomy must be done.

After nephrectomy, the disease involving the remaining stump of the ureter and the lower urinary tract must be considered. It may be necessary to do a ureterectomy on the remaining portion of the ureter if this portion of the ureter has residual infection causing pyuria and persistent cystitis, with tubercular ulcers in the bladder. When the ureteral stump has open tuberculous lesions, some surgeons anastomose the open end of the ureter to the skin in order to facilitate better drainage and lavage. This procedure may fail to cause healing and a secondary ureterectomy may become necessary. At times a vesicoureteral reflux develops and causes a lumbourinary fistula. A secondary operative removal of the stump of the ureter may be necessary. When the remaining portion of the ureter as well as an adjacent portion of the bladder is involved, a ureterectomy and partial cystectomy may be necessary.

The conservative operations that are done when the patient has two kidneys must be considered with extreme caution when a patient has only one kidney that has become infected with tuberculosis. The plastic operations in the patient with tuberculosis of a solitary kidney that are used to relieve hydronephrosis must be accompanied by a nephrostomy or a pyelostomy. Nephrostomy must be considered when the patient has advanced renal tuberculosis in order to prolong his life and make him more comfortable. Again, it is the nephrostomy that must be done when plastic operations are performed on the lower ureter. When the patient has a small bladder with diminished vesical capacity, plastic operations are difficult, especially if they are done extraperitoneally. It may be preferable in these cases to implant the ureter into the skin or rectum and perform a total cystectomy.

The author cites the work done by Cibert to increase the size of the bladder by an ileovesical anastomosis, but he has not had experience with this surgical procedure, for he has not had the occasion to do this operation. He feels, however, that in patients with far advanced vesical tuberculosis, it is always preferable to implant the ureter into the bowel and do a cystectomy in order to remove a large focus of infection and to eliminate the disease associated with the organism.

In conclusion, Gutierrez emphasizes that with the advent of the antibiotics in the treatment of renal tuberculosis, the mortality is usually now associated with a generalized tuberculous dissemination and not due to the process being limited solely to the genitourinary tract. —*Conrad A. Kuehn, M.D.*

Clinical Studies of the Formation of a Urinary Stone (Klinische Untersuchungen zur Harnsteinbildung). K. Boshamer. *Zschr. Urol.*, 1955, 48: 193.

This lecture, given before the Medical Society of Basel, Switzerland, was intended to show that the results of the animal experimentation on the causation of urinary calculus, which has been going on for the past several years at an intensified pace, can be applied clinically in the human being.

The thesis in essence of this scholar who has been working on the problems in connection with the treatment, and particularly the prophylactic treatment of urinary stone recurrence, is that the predominating factor in this type of lithogenesis is an irritated condition of the splanchnic nerve. The splanchnic nerve complex exercises a powerful control over the blood circulation to the kidney. Thus when the urolithic crisis arises, the author does not attempt to specify the nature of this supplemental factor, or factors, inducing this crisis (infection, trauma, humoral factors), as the splanchnic complex produces an anemia, anoxemia, or prerenal anuria in the kidney. During this crisis there is excreted into the renal capsule a colloid substance which has been recently successfully stained by the method of Haase.

This colloid substance, alien to the normal urine and which was demonstrated in the calculi themselves by Korhonen, forms the basis for the formation of stone in the urinary tract. Of course, it will be found in the urine only during the urolithogenic crisis, or constantly in those instances in which the crisis is a continuous one (infected kidneys).

The author bases his theory in most part on the fact that injury to the cord in the region from the sixth to the ninth dorsal vertebrae, whence the nerve roots which supply the nerve fibers to the splanchnic system emerge from the cord, causes a predominance of urolithogenic activity; injuries to the cord above and below this region produce no such predominance. The fact that F. E. Koch in 1949 reported success in the production of urinary stone in dogs by irritating the sciatic nerve merely supports, in the author's opinion, his theory of neurogenic urinary lithogenesis.

Of recent writers, only Magnus has seriously objected to the author's theory. Magnus based his objection to the theory on the fact that such increased incidence of urolithiasis is present in other conditions than those postulated by the author. He found an increased incidence in the presence of vertebral injuries without involvement of the cord. However, the author finds that Magnus has neglected to take into account such

factors as the advent of infection, as proved by the increased incidence in cases of tuberculosis spondylitis, or cases of irritation of the splanchnicus directly (when the fracture is at the same level as the involved region of the cord), or indirectly (when the fracture is above or below this level) with hematoma formation.

Another factor in the production of nerve irritation has been subjected to study by the author, that is, the influence of osteochondrosis of the spine (nerve root pressure). This study consisted in a comparison of the incidence of appearance of the colloid body and the positivity of the petechial test. Here it was found that the presence of the colloid body in the urine (indicating the tendency toward the formation of stone) and the positivity of the petechial test (indicating nerve root pressure) decreased in a parallel manner with treatment for mobilization of the spine.

—*John W. Brennan, M.D.*

Osteitis of the Pubic Bone (L'osteite del pube). VITO D. ARGENTO. *Arch. ital. urol.*, 1955, 28: 56.

THREE INSTANCES of pubic osteitis are reported. In each instance the attack followed a two stage Freyer type of prostatectomy. In 2 of the patients the author mentions the administration of antibiotics before the operation. In each patient the attack started as a febrile attack, followed by severe pains in the pubic region confining the patient to bed. In each instance the roentgenologic examination disclosed decalcification and erosive changes in the pubic bones.

Since the roentgenogram in no instance disclosed evidence of abscess or sequestrum formation, the patient was treated by large doses of vitamin B_1 and a series of roentgen irradiations. In each instance, under the vitamin and irradiation treatment, the pains practically all disappeared, the patients became able to walk, and eventually the decalcification and erosive changes underwent complete repair.

The author, from his experiences in this small series of cases, and from his study of the medical literature, believes that the condition is a form of inflammation, caused by an organism of low virulence, a virulence which has perhaps been reduced by the preoperative administration of antibiotics. The attack of the causative organism is perhaps rendered possible by some form of trauma.

It is admitted that surgery may be indicated in the instances in which the roentgenologic examination shows the presence of abscess or sequestrum; however, when such findings are not present it seems likely that medical measures (vitamin B_1; roentgen irradiation) will be sufficient.

As prophylactic measures the author recommends accurate antisepsis, the avoidance of trauma during the operation, and, in the Freyer operation, the avoidance of the opening of the prevesical space.

The author believes that the operation of Millin should be restricted to patients with clear urine, a low pubic bone, and an abdominal wall of not very marked thickness. —*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Dysplasia Epiphysialis Multiplex; a Report of 14 Cases in Three Families. ROY H. MAUDSLEY. *J. Bone Surg.*, 1955, 37-B: 228.

THE AUTHOR presents 14 instances of dysplasia epiphysialis multiplex in three families. Twelve previously reported cases and the 14 herein described give a familial or hereditary basis for 26 of a total of 40 cases. In each of the three families, 2 or more individuals were affected with this condition.

In the first family, 1 out of 17 members in three generations were affected, including 6 of 8 siblings. In the second family 2 members—a brother and sister—were affected; further detailed investigation was not undertaken. In the third family, a father and at least one son were affected; the rest of the family was not examined. The father was thought by all to be normal until carefully examined and radiographed.

Abnormal roentgenographic features occurred only in the epiphyses in children, and in the joint surfaces in adults. The hip region was affected in all cases. In the children, the affected epiphyses were late in appearing and backward in development, but fusion was not delayed. In the adults, the lesions varied from a slight irregularity of the shape of the femoral head and acetabular roof to severe coxa plana and irregular acetabula. In no case was subluxation present. Osteoarthritic changes occurred in patients over the age of 35 and in one, at least, under that age.

Fairbank (1947) distinguished chondro-osteodystrophy from dysplasia epiphysialis multiplex by the characteristic anterior tongue-like prolongations of the vertebral bodies, the angular kyphosis, and the more severe involvement of the epiphyses, particularly the acetabulum.

The distribution of the lesions in the three families is not the same, but in each family a similarity could be traced in the affection of its individual members. In family 1, there was an obvious hereditary influence, but in families 2 and 3 this was disclosed only after careful inquiry. All the affected members of family 1 were between 4 ft., 6 in. and 5 ft. in contrast to the unaffected father and son who were 5 ft., 6 in. in height. In family 2, the two affected members were normal in height—5 ft., 6 in.—although shorter than other members of the family. The father and son in family 3 were both said to be short.

In family 1, at least three generations were affected and 10 individuals out of 18 had the features of this condition. This points to a genetic basis. The defect appears to be due to a Mendelian unifactorial dominant gene. It is unifactorial because the affected is clearly distinguished from the unaffected. It is possible that more of these individuals would have been found to have affected relatives, but many do not regard themselves or their relatives as abnormal until complications arise or radiographic examination reveals the condition.

In family 1, the frequency of the involvement was, in order: hips, ankles, shoulders, spine, skull. The hands, feet, knees, elbows, and wrists were unaffected. In family 2 the involvement was: hips, shoulders, knees, ankles, hands, feet, and elbows. In families 2 and 3 the hands were stunted and the digits were short, stubby, and blunt at the ends. Movements and function were full. In family 1 there was no abnormality in the hands. In some members of families 1 and 2 the trunk appeared short and the limbs relatively long.

Case 8 of this series showed the features of dwarfism and affection of several epiphyses, but there were no recognizable changes in the hands. A rather unusual feature was the well marked hereditary element. In the affected members of this family there was a relatively high proportion of cases in which the spine was affected, and in some the dwarfism appeared to be of the short-trunk type.

Whereas all these 14 cases thus showed many of the characteristic features of dysplasia epiphysialis multiplex, there are some discrepancies: (1) the hereditary or familial nature of all the cases; (2) involvement of the spine in some cases, causing a short-trunk rather than short-limb type of "dwarfism" in families 1 and 2 (3 not known); and (3) the mild nature of the affection in families 1 and 2. Despite these differences, the characteristic features justify the inclusion of these cases in the condition described by Fairbank as dysplasia epiphysialis multiplex. —*C. Fred Goeringer, M.D.*

Osteoid Osteoma; Clinical, Pathomorphologic, and Etiologic Considerations (Das Osteoid-Osteom. Klinik, Pathomorphologie und Gedanken zur Aetiologie). F. GSCHNITZER and P. F. DE GENNARO. *Zschr. Orthop.*, 1955, 86: 1.

TWO CASES of osteoid osteoma, first established as an independent nosologic entity by Jaffé and Lichtenstein, are reported by the authors on the basis of their own experience.

In the first case there was an amputation specimen, including the terminal phalanx and part of the middle phalanx of the little finger of the right hand. The clinical diagnosis in this instance was tuberculosis and the pathologicoanatomic diagnosis was resorption tumor of the terminal phalanx (so-called giant cell sarcoma). The history of the condition and the earlier work on the specimen were no longer available.

Histologic study at the laboratory disclosed a central lesion with the osseous cortex largely destroyed. The joint cartilage and subchondral bone was intact. The lesion itself consisted of a network of osseous trabeculae of embryonal structure, bizarre in form and rather heavily ossified, more heavily calcified in the periphery than at the center. The whole was surrounded by a capsulelike structure of uncalcified tissues, carpeted in places on the surfaces facing the lesion by epitheliumlike osteoblasts. A lamellar structure was suggested only in a few areas. The outer surface of the lesion was in many places beset by depressions partially covered by giant cells of the

osteoclastic type. The narrowlike tissues within the lesion were rich in nuclei and disclosed edematous areas. Lymphocytes and plasma cells were sparingly present. There were present numerous blood vessels with walls in contact with cells of giant cell character. The marrow of the bone itself was partially fibrous, partially fatty. This tissue was permeated by infiltrations of the round cells. In the light of this study the lesion was recognized as an osteoid osteoma.

The second specimen was procured from a 16 year old youth who, for the previous year had been suffering from pains, particularly nocturnal, in the region of the right knee. These pains were soon followed by similar pains in the region of the right hip. The trochanter was tender to pressure.

The roentgen examination disclosed, as the sole finding, a defect in the right trochanter major, near its surface. This area was opened with the chisel and the bean-sized lesion was curetted out. The material procured by curettement was diagnosed as a brown tumor of the right trochanter major. The histologic examination led to the diagnosis of regression of a benign giant cell tumor of the trochanter.

Re-examination of the specimen at this later date disclosed the fact that the histological picture was identical with that of the first case. The diagnosis was now changed to read: osteoid osteoma of the region of the right trochanter (cortical osteoid à la Moberg).

In addition to this personal material there were 4 histologic preparations of osteoid osteoma from Italy, all of which had been correctly diagnosed clinically and the diagnosis verified pathologicohistologically. In 2 of these 4 specimens there were visible in the capsule small arteries with lumena almost closed by marked thickening of the intima and media. About these constricted vessels in both instances were numerous infiltrations of lymphocytes and plasma cells. Here and there was evidence of small hemorrhages.

From their experience with this material and from their study of the literature, the authors have come to support the inflammatory theory of osteoid osteoma, considering the condition to arise as the result of a local inflammatory bone-forming osteomyelitis or osteitis due to bacterial infection.

—*John W. Brennan, M.D.*

Degenerative and Chronic Inflammatory Diseases of the Spine in Their Relation to the Low Back Pain Syndrome (Degenerative und chronisch-entzuendliche Krankheiten der Wirbelsaeule in ihren Beziehungen zum Symptomenbild des Rueckenschmerzes). ALFONS LOB. *Muench. med. Wschr.*, 1955, 97: 553.

REPORTED STATISTICS and the author's own experiences indicate that 25 to 40 per cent of patients operated upon for protruding discs continue to complain of persistent low back pain. After disc removal, the anatomicophysiological unit of nerves, muscles, and vascular supply is often still in a condition of imbalance. All parts of the spine, with the possible exception of the discs, have a nerve supply, and the dorsal ramus carries the motor, sensory, and sympathetic fibers to the back muscles, small vertebral articulations, capsules, periosteum, and ligaments.

The slow metabolism of the disc with loss of its normal water content (annulus fibrosus, 70 per cent; nucleus pulposus, 76 per cent) after the third decade results in degenerative, dehydrating, disrupting changes on a hormonal and constitutional basis and is not caused by functional, mechanical overstrain. The resulting instability leads to degenerative changes in the small vertebral joints, collectively called "arthrosis deformans," with the triad of (1) disc necrosis and protrusion, (2) structural changes in the vertebral body with sclerosis, and (3) arthrosis deformans of the small vertebral joints.

It must be emphasized that disc degeneration is not confined to one segment but involves the whole system of the cervical, dorsal, and lumbar spine. In analyzing the pain, the author states it is caused by local spinal changes perceived directly, or by irritation of pain-carrying sensory fibers; for example, the fatigue pain caused by muscular strain that is not on an inflammatory basis. Low back pain in disc degeneration with resulting vertebral instability is caused by ligamentous and capsular tearing and reflex muscle spasm.

Inflammatory spondylarthritis ankylopoetica, the etiology of which is still obscure, is apparently on the increase. In the author's clinic 107 cases have been so diagnosed.

On the basis of his own experiments (not described in detail), the author concludes that any irritation near the spinal column can lead to chronic inflammatory changes within the spine and in the sympathetic system via the kinetic chain, caused by toxins or by an allergic-hyperergic reaction with fibroplastic changes as found in the collagenous diseases, and hormonal, central impulses via the hypophysial-adrenal system.

—*Ernest H. Bettmann, M.D.*

The Ribbon-Flap Tendons as a Plastic Substitute for the Crucial Ligaments of the Knee (Die gestielte Sehne als plastischer Ersatz der Kreuzbaender). F. W. RATHKE. *Zschr. Orthop.*, 1955, 86: 29.

THE OPERATION of Lindemann, i.e., plastic substitution for the crucial ligaments of the knee, was comprehensively described and illustrated in this Journal 5 years ago (SURG. GYN. OBST., INTERNAT. ABSTR. SURG., 1950, 91: 389). The motivation for the publishing of this article seems to be double. First, there can now be evaluated a material of 23 operations by this method, some of which were done as early as 10 years previously. Second, the author has recently had the opportunity to attend the autopsy on one of the patients.

Briefly considered, in the substitution of the gracilis or semitendinosus muscle for the anterior cruciate ligament, the tendon of the muscle chosen is passed through an aperture made in the posterior aspect of the joint capsule, very close to the lateral femoral condyle; it traverses the joint cavity between the condyles and is then passed through a hole drilled obliquely through the anterior margin of the tibial plateau, to be finally sutured to the patellar ligament. In the substitution of the gracilis tendon for the posterior cruciate ligament the hole is drilled obliquely through the medial condyle. Through this drill hole the tendon is passed and, after traversing the intercondylar joint space, it is sutured to the fascia and ligamentous remains of the original posterior cruciate ligament on the posterior surface of the upper

margin of the tibia. In both instances the tendon is attached at only one place.

That the single attachment of the tendon, as above mentioned, results in the elastic pull of the muscle belly and gives the plastic ligament an additional bracing effect is indicated not only by the subjective feeling of added security, as reported by the patients themselves, and not only by the elimination or diminution of the slipping forward and backward of the tibial plateau on the femoral joint surfaces (push and pull sign; "Schubladenphaenomen"), but the muscle belly of the substituting tendon actually becomes powerfully hypertrophied. This suggests that it might have assumed some function other than its normal physiological one, and at the autopsy on the patient who had undergone a substitution operation on the anterior cruciate ligament, the capsule at the site of perforation was only slightly adherent to the tendon passing through it.

In the 23 operative cases here evaluated, substitution of the muscle tendon for the anterior cruciate ligament was done in 18 cases and for the posterior cruciate ligament in 5 cases. There were only 4 patients in whom the results could be said to be unsatisfactory. In all the others the reports consist of satisfied patients with strong supple knee joints as a result of the intervention.

The unsatisfactory results can hardly be ascribed to the method; 1 poor result was due to the aseptic necrosis of the previously fractured and incorrectly reduced fracture of the lateral femoral condyle; 1 was the result (ankylosis) of a chronic infective process, perhaps ascribable to insufficiently exact aseptic operative technique, and 1 was the result of simultaneous repair of the medial collateral ligament and of the anterior cruciate ligament; here it was the collateral ligament which gave way. It may be remarked that these two operations should not have been done simultaneously. The reason for this statement lies in the well known fact that the postoperative care of the collateral ligament repair consists essentially of a long period of immobilization of the joint in a plaster cast, while the repair of the cruciate ligament requires early mobilization.

The fourth unsatisfactory result has already been reported by Lindemann (already cited). This was a case in which the substituting gracilis tendon was supplemented by a strengthening of the medial collateral ligament by means of the tendon of the sartorius muscle. Here again the original good union gave way later. —*John W. Brennan, M.D.*

Aseptic Osteonecrosis of the Articular Surface of the Upper End of the Tibia (Aseptische Osteonekrose an der Gelenkflaeche des Schienbeinkopfes). KURT SCHLÜTER and WERNER MEY. *Zschr. Orthop.*, 1955, 86: 42.

TWO INSTANCES of aseptic osteonecrosis of the joint surface of the upper end of the tibia are reported. Such lesions have not previously been published.

The first patient was a 13 year old girl who visited the poliklinic complaining of vague knee disturbances. The examination at this time resulted in the diagnosis of bilateral osteonecrotic lesions of the medial femoral condyle. At operation a nailing of the lesion was carried out—this method of treatment will later be reported by Hauberg. A month later the trouble was located in the lateral portion of the knee joint. Roentgenologic examination at this time led to the diagnosis of a probable osteonecrotic lesion in the upper end of the tibia. The tomographic study substantiated this diagnosis and the trepanation of the lesion confirmed the tomographic findings.

Histologic examination of the trepanation specimen disclosed the fact that only the osseous portion of the joint was involved; the cartilaginous roof seemed intact; however, at the time of the trepanation the cartilage was easily depressed by the probe. This ended the symptoms; after removal of the nail, weight bearing by the limb was resumed.

The second patient was a 59 year old male who during the first World War had injured his knee by a collision of his motorcycle with a railway train. The knee was swollen for a few weeks but could still be used for weight bearing. The knee function returned to normal.

At the present time he complained of pains and grating sensations in the left knee with changes in the weather. Here again the presence of an osteonecrotic lesion was suspected from the roentgenogram and confirmed by means of the tomogram, which disclosed the presence of an osteonecrotic lesion and joint mouse formation at the same location as in the first case reported, that is, in the anterolateral portion of the upper joint surface of the tibia in the area not covered by the lateral meniscus.

In the matter of etiology the author accepts in general the theory propounded by Ribbing (*Acta radiol.*, Stockh., 1937, Supp. 34, and INTERNAT. ABSTR. SURG., 1938, 66: 489) who described such lesions in the femoral condyle. Ribbing assumes that such lesions arise out of isolated centers of ossification by a process of vascular interruption (trauma). The author by analogy assumes the possible development of similar conditions in the tibia; in fact, he has been able to find such accessory centers of ossification frequently in the upper end of the tibia of children up to the fifth year of life. The author, however, could find no evidence of hereditary taint and no evidence of hormonal disturbances.

Calling the attention of the profession to these findings seems justified in the interest of clearer judgment in disturbances in the knee joint of unclear etiology. —*John W. Brennan, M.D.*

Peroneal Spastic Flat Foot. N. J. BLOCKEY. *J. Bone Surg.*, 1955, 37-B: 191.

THE AUTHOR reports the results of treatment in 30 cases showing the peroneal spastic flat foot deformity. Peroneal spastic flat foot can occur without a developmental tarsal anomaly and such an anomaly does not necessarily mean that the foot is incorrigibly stiff. In this series of cases there was no evidence suggesting that organic nervous disease or psychiatric disturbances played a significant part in the production of the deformity, nor was there any evidence that the deformity is a manifestation of generalized rheumatoid arthritis. The present investigation does not reveal the cause of the deformity when the tarsal skeleton is normal, nor does it help to explain the reason

for the onset of symptoms in a developmentally abnormal foot.

All the feet in the present series were manipulated under anesthesia, sometimes with the use of a relaxant. This has produced one of three results: (1) the foot has fallen without effort into the neutral position, from which it could easily be placed into full inversion (16 cases); (2) the foot has assumed a position of less inversion, and full inversion has been obtained with force only, accompanied by the tearing of adhesions (7 cases); (3) the foot has remained in a position varying between neutral and preanesthetic state (7 cases).

Additional investigations were undertaken in some cases in which the foot relapsed after treatment, and in some showing particularly striking clinical features. Electromyography was carried out in 2 cases, using surface and needle electrodes. The lateral compartment of the leg was explored under local anesthesia in 3 patients to determine visually which muscle-tendon unit was responsible for the deformity. When the peroneus brevis seemed to be largely responsible its nerve supply was crushed, leaving the nerves to the other evertors intact. The so-called reflex spasm was studied by injecting the sinus tarsi with anesthetic solutions, and in the course of fusion operations material was taken for histologic examination. In all cases the foot was examined under anesthesia to assess the degree and rigidity of the eversion. A walking plaster was then applied with the foot inverted as far as possible, and retained for 3 months, after which the range of active and passive movement was determined. Thereafter treatment has been by physiotherapy, sometimes with lateral steels and shoe alterations for the rest of 2 years. When subtalar and midtarsal arthrodesis was required it was undertaken at the end of the 2-year period.

The results at 1 year showed that of the 16 feet in which a full range of inversion could be produced under anesthesia without any force, 4 cases remained the same at 1 year. Six cases were still symptom-free and possessed full range of active inversion. Six feet relapsed to some degree—2 completely, and 4 having everter spasm, loss of inversion, and slight pain, although considerably less than when the patients were first seen.

Of the 7 feet in which full inversion was obtained only after tearing adhesions, 1 was normal a year later, 4 lacked full inversion but caused no pain, and in 2 pain and valgus had returned as before. Taking these cases together as one group in which full inversion was possible under anesthesia, it was found that of 23 feet, 7 were normal, and a total of 19 showed improvement over the condition present before manipulation.

Two years after the beginning of treatment, 3 of the 23 feet in which full inversion was possible under anesthesia remained normal at 2 years. The 17 feet that were improved but not normal at 1 year deteriorated during the second year and 8 returned more or less to the same state as when first seen. Four feet required subtalar and midtarsal arthrodesis. Of the original total of 30 feet, 2 were normal, 16 were improved in varying degree, 8 were the same, and 4 required operation. —*C. Fred Goeringer, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Use of Ossopan in Orthopedic Conditions (Erfahrungen mit Ossopan bei orthopaedischen Erkrankungen). O. Popp. *Helvet. chir. acta*, 1955, 22: 140.

The effects of ossopan, which is made from the cartilage and bone of growing animals, were studied in 47 patients with various orthopedic disorders (bone defects, bone grafts, delayed healing of fractures, transformation zones, Sudeck's atrophy, and senile osteoporosis).

Despite numerous roentgenographic films demonstrating the effectiveness of this preparation, the authors have failed to prove an objective therapeutic effect because of lack of control series. Furthermore in 10 cases of successfully treated osteoporosis, ossopan treatment was combined with medication with testosteronecortin, vitamin B, and vitamin C (without chemical studies). It is known also that all of the disorders treated can heal spontaneously within a longer time. The claims made are on a purely subjective basis. —*Ernest H. Bettmann, M.D.*

Lumbosacral Arthrodesis After Laminectomy. E. W. O. Adkins. *J. Bone Surg.*, 1955, 37-B: 208.

The author believes that the conventional methods of posterior fusion after laminectomy are not satisfactory (including the conventional methods of spine arthrodesis as well as the easy interbody operation). The intertransverse method is believed to be the most promising method, particularly in the cases in which it is considered necessary. For technical reasons, an interpedicular (or alar-pedicular) fusion, although it produced a few good results, was considered unsatisfactory and was soon abandoned in favor of the more certain intertransverse (or alar-transverse) arthrodesis.

After any extensive operation on the lumbosacral spine, involving partial laminectomy, there is often dense fibrosis in the region of the excised lamina and ligamentum flavum, and also within the intervertebral space itself, if the disc has been resected.

The intercorporeal bone grafting, although it appears to aid the formation of a firm, fibrous ankylosis, proved to be ineffective as a method of producing bony arthrodesis.

When intertransverse grafts are used the dissection of the erector spinae laterally is continued from the pedicles to expose the transverse processes and alae of the sacrum. This is easier when the facets have been removed but if these are intact it can be performed quite satisfactorily without disturbing them. A groove is cut in the upper or lower border of the transverse process with a sharp gouge. Great care must be taken with this part of the operation, for the transverse process is easily fractured, and, in the event of fracture, firm impaction of the graft is impossible. For the lumbar 4 to 5 joint, a tibial graft is cut with V-shaped ends; it is inserted obliquely between the transverse processes and then rotated into position so as to cause slight distraction of the processes and become firmly impacted between them. For the lumbosacral joint the graft is cut V-shaped at its upper end and straight but slightly obliquely at its lower end. One arm of the

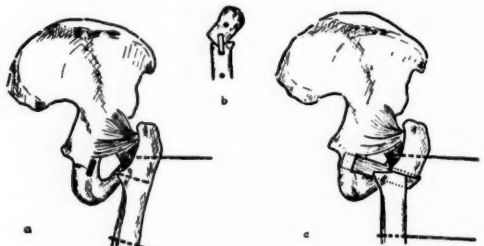

FIG. 2 (Müller). Technique of the ischiofemoral arthrodesis (rear view). a. The introduced screws allow for exact correction during the procedure. With the notch in the acetabular portion of the ischial ramus distal from the acetabulum osteotomy of the femur is done at the level of the lesser trochanter. b. Sideview of the window in the osteotomy level after correction of flexion contracture. c. Correction of adduction by parallel positioning of the screws. The tibial graft is hemmed in between the femoral shaft and base of the ascending ischial portion with the cortex facing the sciatic nerve; the distal femur fragment is shifted medially for a distance of one-quarter thickness of the shaft, followed by removal of the screws. Nine patients between the ages of 7 and 40 years were operated on.

V is inserted in front of the transverse process and the lower end is punched into the slot in the sacrum. Bilateral grafts are best because they afford a considerable degree of internal fixation. The grafts must be placed as far laterally as possible to avoid their contact with the emerging nerve roots, and also to gain the maximum mechanical stability.

The method has given some excellent results. The commonest of errors is failure to obtain firm impaction of the grafts. This may be caused by using too short a graft, by applying it to the concave side of a spinal curve so that it disimpacts on straightening the spine, by failure to cut adequate grooves in the transverse process or ala, or by fracture of the transverse process.

Up to the end of 1952, a total of 30 patients (20 with disc lesions and 10 with spondylolisthesis) were treated by this method. One patient died of pulmonary embolism 16 days after operation. In the remaining 29 patients the results were as follows: certain fusion in 17 (59%); probable fusion in 7 (24%); failure in 5 (17%). The cases listed as having certain fusion show incontrovertible radiographic evidence of fusion. In all of these the grafts are firmly incorporated at both ends and there is definite buttressing, often of massive dimensions, by new bone around the grafts. The cases listed as having probable fusion all appear stable in mobility films.

—*C. Fred Goeringer, M.D.*

The Extra-Articular Ischiofemoral Hip Arthrodesis (Die extraartikulaere ischiofemorale Hueftarthrodese). M. E. MÜLLER. *Helvet, chir. acta*, 1955, 22: 127.

EXTRA-ARTICULAR ischiofemoral hip arthrodesis, originally designed by Trumble in 1932 (who did not employ osteotomy of the femur), was perfected by Britain in 1942, and was found to be a much safer procedure than iliofemoral arthrodesis.

The authors describe the operative procedure:

With the patient in a prone position the aponeurosis between the tensor fasciae and the gluteus maximus is opened with a posterolateral incision starting at the posterior superior iliac spine and ending below the gluteal fold. After dissection of the gluteus maximus and retraction of the sciatic nerve medially, the proximal insertion of the lateral vastus is dissected and freed from the femoral shaft. The posterior ischial portion is exposed up to the acetabulum. After dissection of the quadratus femoris near the acetabular portion the obturator foramen is partly opened. The insertion of the medial graft segment is near the acetabulum at the level of the quadratus femoris insertion. This place is marked by a chisel without opening of the joint capsule. Two screws of 5 mm. diameter are driven into the femur with the proximal one in the greater trochanter and femoral neck, and the second one 6 to 8 cm. more distally in the femoral shaft. Osteotomy of the femur is usually done through the lesser trochanter toward the prepared bed at the ischial base. A cortical tibial graft is introduced through a window of equal width in the proximal and distal femoral fragment toward the ischium with the osteotomized gap separated by leg traction, the tip penetrating 1.5 to 2 cm. deep into the prepared notch of the ischium; this is followed by medial displacement of the distal fragment. After placing spongious bone around the bed the screws are removed. The dissected muscles are resutured. A hip spica and a long leg cast are applied for 3 months, and after this a hip spica for ambulation is applied. There is solid union after 5 months.

The following three details are important:

1. The bony bridge should be short and be placed cranially. An angle of 100 degrees between the graft and femur is sufficient. The notch should not be placed within the ischial tuberosity but further proximally. 2. In order to avoid nerve lesions the ischiatic nerve, lesser trochanter, and the acetabular portion of the ischial ramus have to be exposed. 3 The graft is placed with its cortical side toward the sciatic nerve. Plates or screws are not necessary. —*Ernest H. Bettmann, M.D.*

FRACTURES AND DISLOCATIONS

Supracondylar Fractures of the Humerus in Children. ERIN MADSEN. *J. Bone Surg.*, 1955, 37-B: 241.

THE AUTHOR describes several methods of treatment of displaced supracondylar fractures of the humerus in children. He states that a good result depends on precise reduction, safe fixation, and careful and prolonged after care. Remodeling of the humerus may improve the result but cannot be expected to overcome a varus deformity. Reduction is accomplished with the aid of (1) mechanical traction; (2) lateral rotation applied during the traction; (3) varying degrees of pronation and extension of the elbow, and (4) direct manipulation.

He describes an apparatus which will afford traction and varying degrees of elbow extension, as well as lateral rotation, and pronation and supination. Radiographs or fluoroscopy are employed during the reduction. With patience and care, the author be-

lieves that at least 90 per cent of these fractures can be satisfactorily reduced. For fixation, a plaster shoulder spica is applied while the traction is maintained and with the arm kept in lateral rotation. After treatment is limited to active motions within the limits of pain.

The results and follow-up data in 30 cases are reported. Anatomical studies indicated that only in one patient with 25 degrees of varus was the result considered poor. Twenty-four of the 30 children had ideal functional results with a normal range of motion, normal appearance, and no complaints. Four children had a normal range of motion but a varus deformity of 5, 8, 9, and 15 degrees, respectively. One of these had a radial paralysis. One patient lacked 35 degrees of extension and had a 25 degree varus deformity.

The author's results compare favorably with those of Holmberg (open reduction and arm plaster), and Jensenius (manipulative reduction and arm plaster).

—*Norman J. Rosenberg, M.D.*

Traumatic Luxations of the Elbow Joint: Statistical Considerations with Reference to Etiology and the Results of Treatment (Lussazioni traumatiche del gomito; considerazioni statistiche sull'eziologia ed esiti). A. MOTTA. *Policlinico, sez. prat.*, 1955, 62: 419.

SIXTY INSTANCES of traumatic luxation of the elbow joint are reported. Five types of luxation are illustrated in this material: posterior luxations (39 cases), anterior luxations (4 cases), posteroexternal luxations (9 cases), lateral luxations (6 cases), and medial luxations (2 cases). Of the posterior luxations, 28 were produced by force exerted against the palm of the hand with the elbow joint in extension; 9 were produced by force exerted against the elbow joint itself while it was in a position of flexion of not less than 90 degrees; 2 were produced by imprecisely determined stresses. In the anterior luxations the author finds that the anterior and posterior ligaments were all that were lacerated, the lateral and medial collateral ligaments remaining intact.

Of the total of 61 cases, 56 could be followed up and the results attained by treatment observed at a later date. In 32 of this number the results were optimal, the patient regaining full and painless use of his elbow joint. Of this last number, 22 had posterior luxation, 4 posteroexternal luxation, 3 anterior luxation, 2 medial luxation, and 1 lateral luxation. The results were good but not optimal in 12 patients. This group included 8 with posterior luxation, 3 with posteroexternal luxation, and 1 with lateral luxation. The results were poor in 12 patients. This group consisted of 6 with posterior luxations, 4 with lateral luxations, and 1 each with posteroexternal and anterior luxations.

These poor results were the sequelae of an arthrosis of the articular joint surfaces, associated, particularly in the patients in whom there was a comminuted fracture, with ossification of the ligaments, the anterior ligaments being involved especially. In the patients in whom it was necessary, after the reduction had been done, to intervene surgically in order to fix the epitrochlear process or the epicondyle, there was a retardation of the return of articular function and frequent appearance of ossification processes. Pain and diminution of force was noted in all the cases in which the result was classified as poor.

In the cases in which the immobilization was maintained for more than 13 days there was difficulty in procuring even a limited amount of articular function, and associated osteoarticular lesions of the arthrotic type were always present.

—*John W. Brennan, M.D.*

Isolated Fracture of the Upper End of the Fibula (Le fratture isolate dell'estremità superiore del perone). C. CHERUBINI. *Ortop. traumat. app. motore*, 1955, 23: 109.

CONTRIBUTIONS to the subject of isolated fracture of the upper end of the fibula have not been numerous and the more recent ones have been concentrating on the aspect of etiology and of pathogenesis (the traumatic mechanism), rather than exhausting the subject of treatment. Such matters have been rather fully covered in the first volume of Schinz, Baensch, Uehlinger, and Friedel's *Lehrbuch der Roentgendianostik*, or its English translation by Case: *Roentgen-Diagnostics*, in which the author confines himself chiefly to the problems of therapy.

The author, as a result of his experience at the Orthopedic Clinic of the University of Siena, Italy, believes that in the fractures without displacement, immobilization of the part in a plaster knee splint will afford a satisfactory result in most instances, with complete return of function in the knee. Surgical intervention will be reserved for those patients in whom the fragments have become widely separated, or in whom there is also a nerve injury which needs attention. The fracture in the latter instance is exposed by a vertical incision which is placed anteriorly to the fibular head in order to shield the external popliteal nerve from accidental harm.

After reduction of the fragment it is fixed in place by wiring, or by means of a silk suture which passes through perforations in the two fracture ends. In the untreated fracture the descent of the displaced fragment may be favored by flexing the knee; such procedures were successfully resorted to in one of the author's patients.

In instances in which the lateral collateral ligament of the knee joint has been lacerated, it should be sutured, or, when this is not possible, it should be reconstructed. When the tibiofibular ligament is ruptured, the fibular fragment may be just as well fixed with wire suture or by nailing it to the superior metaphysis of the tibia. The last mentioned procedure is followed by an adequate period of immobilization in plaster.

In the patients exhibiting paralysis of the external popliteal nerve, the treatment method will, of course, be guided by the condition of the nerve injury which is encountered at operation. In instances in which the nerve has been torn, neurorrhaphy will be practiced; when the nerve is suffering compression by inclusion in the callus, neurolysis will be done.

Function will be restored in cases with fracture and injured nerve in a period of from some weeks to some months, the longest period for restoration of function being that for the neurorrhaphy cases.

—*John W. Brennan, M.D.*

Traumatic Dislocation of the Hip Joint Associated with Fracture of the Neck or Diaphysis of the Femur (Lussazione traumatiche dell'anca associate a fratture del collo o della diafisi femorale). MARIO MORISI. *Chir. org. movim.*, 1954, 40; 267.

THREE CASES of dislocation of the hip with fracture of either the neck or diaphysis of the femur are presented. The details of the roentgenologic examination and of the methods and of treatment are included in the legends of the appertinent roentgenograms.

The first patient was a 44-year-old male with a posterior dislocation of the left hip joint and a transverse fracture of the neck of the femur. The dislocation had occurred a month previously. It had been treated by wire traction which did not reduce the displacement. The day before admission to the hospital he had suffered a fall with injury again in the region of the left hip. At operation the acetabulum was emptied of fibrous tissue and a raw surface produced to effect an arthrodesis. The head of the femur was freed of the remaining cartilaginous covering, placed in the hip socket, and fastened in place by means of a Putti screw. The trochanter was replaced, the wound closed, and a plaster cast applied. On examination 10 weeks later the arthrodesis was solid and painless. Four months later the arthrodesis allowed some motion of flexion and extension; however, the joint was firm under weight-bearing, and walking was painless There was a shortening of 2 cm. The roentgenogram showed some atrophy of the femoral head.

The second patient was a 49-year-old male who had been struck on the left thigh by an automobile and hurled against a moving tram, again striking the left hip. The roentgenogram disclosed a transverse fracture in the cervical region of the left femur, and posterior dislocation of the femoral head with fracture of the condyloid roof. Here again the trochanter was chiseled loose to get at the articular structures, the head of the femur was replaced in the acetabulum and fastened to the femoral neck by means of wiring. The wound was closed and a cast applied. Four months later the joint was somewhat rigid, but firm on weight-bearing, and painless. Two years later the head of the femur was quite regular in outline, and its density was normal; the neck of the femur was shortened. There was some pain following extended use of the joint. The roentgenogram disclosed excellent consolidation of the fractures; however, there was some evidence of arthrotic changes in the joint surfaces.

The third patient was a 44-year-old male. While riding in an automobile five months previously the speeding vehicle went out of control, striking a tree and hurling the victim against the front panel of the car (dashboard dislocation, as described by King and Richards in *J. Bone Surg.*, 1941, 23: 533). There was dislocation at the joint and fracture of the diaphysis of the femur in its middle third. The patient had been placed in traction but the posterior dislocation had not been reduced and a pseudarthrosis had formed at the site of fracture. At operation the fracture was infibulated and an onlay graft from the tibia fixed in place with Putti rings. Consolidation was excellent. At the second operation, 3 months later, the trochanter was chiseled loose and turned back, the adhesions about the dislocated head were cut, the acetabulum emptied and reduced to a raw surface, and the head decorticated and returned to the hip socket. The fragment of trochanter was placed in a slot in the roof of the acetabulum, the wound closed, and a plaster cast applied. Seven months later the arthrodesis was firm and painless, and the patient was able to walk for long distances without discomfort. The shortening was 3 cm. Roentgenologically the epiphysis was in good position and the trochanteric transplant was healed.

In the treatment of these injuries, the author prefers surgical intervention. Permitting the fracture to consolidate before correcting the dislocation has many disadvantages, not the least of these being the changes which tend to develop in the acetabulum when it is deprived of its normal function. When the fracture which accompanies the dislocation is located in the distal third of the femur replacement of the femoral head may be accomplished manually and the fracture itself may be treated without operation. In the recurrent dislocation with extensive adhesions involving the upper end of the femur and the acetabulum obliterated surgery is generally necessary. Pseudarthrosis also will not be cured without an operative procedure. —*John W. Brennan, M.D.*

ORTHOPEDICS IN GENERAL

The Recovery of Function in Mutilations of the Upper Extremity (Il recupero funzionale per mutilazioni nell'arto superiore). E. MARCER. *Fracastoro*, 1954, 47: 211.

THE AUTHOR takes the reader through the entire gamut of mutilations of the upper extremity, from the loss of the end of a finger to disarticulation at the shoulder joint. In this discussion he touches solely on matters of general interest; the details of most of the procedures have already been given in preceding reports. The methods of substituting for parts of fingers have largely been abandoned in favor of plastic prostheses. A special discussion, however, is allotted to the loss of the thumb. The transplantation of the index finger to the head of the first metacarpal to replace the thumb has also largely been abandoned in favor of the phalangization of the second metacarpal for the thumb and first metacarpal. This has now been carried out 107 times, with good results in 98 cases. When the index finger also is lost, the problem becomes a particularly complicated one. The pollicization of the third metacarpal is a risky procedure but it has been carried out in one case with good results.

Good results can be obtained when several of the fingers are missing but the thumb remains intact. Even when the fifth finger is all that can be conserved, the opposition and utility of the apposition of the thumb and little finger give even better results than the opposition of the thumb to the other fingers, since the muscles of the thenar and hypothenar eminences form an especially mobile and strong plastic mechanism. When all the fingers are missing it is necessary to construct an artificial element to oppose to the thumb.

When only the metacarpals are available they must be phalangized, and, on occasion, one or more of the middle metacarpals are sacrificed in order to produce

a better grasp and to procure sufficient soft tissues to cover the resulting structure.

When only the carpal bones remain, but these structures evidence an efficient flexion and extension, they form an excellent key to the construction of a cinematic stump, in the sense of Vanghetti. At the National Center for Orthopedic Surgery, Parma, Italy, the author has constructed a cinematic prosthesis for the carpal hand, which utilizes the active movements of the carpal bones and produces a structure with excellent grasping power.

With loss of the hand at the wrist joint, the choice of the method to be adopted is not always easy. This subject was discussed by the author at the 1950 meeting of UNESCO, at Geneva. Here the method must be varied according to the needs of the mutilated individual. For the person who desires to engage in heavy labor, the "claw hand" of Krukenberg-Putti-Delitala (*Internat. Abstr. Surg.*, 1952, 94: 187) seems to offer the best solution. For those with lighter occupations and for women the cosmetic deficiencies of the claw hand becomes a serious objection and a more esthetic form of cinematic prosthesis (Vanghetti) may be preferred. The Vaduz electric hand is still in the experimental stage, is costly, and can be put to efficient use only by a more than ordinarily intelligent subject. The author's collaborators, Vinditti and Peresson, have recently suggested improvements in the Krukenberg hand which permits the application of an extremely efficient cinematic prosthesis. The claw-hand type of reconstruction is particularly important in blind subjects, since they need grasping structures which possess sensation.

The author's statistics include 92 cases of this kind; 18 of these mutilations were bilateral. Results were optimal in approximately 90 per cent of instances. In 11 of these patients the results were unsatisfactory; the fault was found to reside in a lack of sufficient grasping power, in trophic disturbances in the covering skin, in ossification of the interosseous membrane, or in a tendency to habitual luxation of the head of the radius.

In this type of patient the author has used the Vanghetti type of cinematization 78 times, with good functional results in 85 per cent.

As the amputation level moves further up the forearm the cinematization of the stump with the aid of the muscles about the elbow or, indeed, of the upper arm becomes more and more important. The results of cinematization, using the muscles of the upper arm for grasping and loosening of the grasp, and the forearm stump for the movements of flexion and extension, are especially good.

In amputations above the elbow one can utilize only the muscular power of the biceps and triceps to activate an artificial hand.

In disarticulations at the shoulder one employs cinematization of the pectoralis major and the latissimus dorsi muscles. Without such a procedure the prosthesis would not have a sufficient hold on the stump of the shoulder. With these muscles for power and retention of the prosthesis it is possible to construct a usable hand with a mobile elbow section.

In closing, the author emphasizes the fact that every bit of finger length, forearm length, or humeral stump that can be saved adds to the possibility of functional recovery. —*John W. Brennan, M.D.*

The Treatment of the Paraplegias in Cases of Scoliosis (Die Behandlung der Querschnittslaehmungen bei Skoliosen). F. SCHEUER. *Zschr. Orthop.*, 1955, 86: 48.

FOUR CASES of the development of paraplegia in patients with a scoliotic deformity are reported by the author.

The first patient was a youth of 18 years with high grade idiopathic scoliosis with convexity to the right side and the apex of the deviation at the level of the eighth dorsal vertebra. The deviation was almost right-angled.

Following a strenuous game of football a spastic paresis of both legs with hypesthesia of the entire right limb developed. The patient was placed in a plaster cast; nevertheless, despite the 7 months' supportive treatment to the spinal column the paretic condition became progressively worse. In addition to the muscular weakness there were vascular and reflex disturbances, but there were no symptoms.

At operation any of the bone structures which appeared to exert pressure on the cord were removed and the seventh and eighth posterior spinal roots, which seemed to be exerting a pull on the cord, were cut. Four weeks after the operation improvement set in, and after 6 months the symptoms of the condition had disappeared entirely with the exception of some exaggerated liveliness of the reflexes.

The second patient was a 17 year old girl with a congenital scoliosis in the form of a wedge-shaped deformity of the twelfth dorsal vertebra. The convexity of the deformity was to the left side and was not marked. There was also present a high grade spina bifida of the fifth lumbar vertebral arch with pigmentation of the skin and hirsutism over the defect. Fourteen days previously the patient had strained herself while lifting and then noted a rapid development of weakness in the legs, particularly in the left leg, and there was a complete anesthesia on the left side from the eleventh dorsal root downward. After 4 weeks of immobilization in a plaster cast improvement began, and 5 months later the spastically paretic legs had so recovered that the patient was able to stand alone. Less than a year after application of the cast, the patient was able to return to work (farm work).

The third patient was a poorly nourished 19 year old girl with very severe scoliosis of the dorsal vertebra on the right side with the summit of the deformity at about the seventh and eighth dorsal vertebrae. The spastic paresis of the legs was more marked on the left side. As in the instance just cited, excellent results were obtained with cast immobilization. Nineteen months later the symptoms had all disappeared except for noticeably exaggerated reflexes.

The fourth patient was a 22 year old woman with a monstrous kyphoscoliosis of the thoracic regions of the spine, with the summit of the deformity to the left. The spastic paresis and hypesthesia, worse on the left side, began without apparent incident. The contrast material, injected at the level of the fourth and fifth lumbar vertebrae rose easily as far as the summit of the deformity, but it only seeped gradually past this point.

At operation any osseous structures which seemed to be exercising pressure on the cord were cut away, as were two posterior spinal nerve roots. The dura had to be opened and could be closed only plastically (amnion transplant). Six months later the paretic condition of the lower extremities had disappeared almost entirely, the moderate disturbance of the bladder and rectum was gone, and the ovarian function was entirely normal. There remained only a certain loss of the general strength of the right leg and the gait was somewhat uncertain. However, the patient was highly neurotic and now complained of gastric distress. The author wonders if the cutting of the posterior nerve roots had anything to do with this complaint. In the other patient who was operated on this procedure did not seem to produce any sequelae.

The author believes that conservative measures should be tried first in these cases; however, if there is no improvement, then laminectomy is indicated. If, when the spinal dura is exposed, it shows pulsations above and below the point of pressure the opening of this covering of the cord may be eliminated. If, however, pulsation is suppressed, the assumption is that the dura itself is exercising pressure and must be opened. If it is opened, it should be repaired plastically. —*John W. Brennan, M.D.*

Osteomyelitis of the Hip in Babies and Small Children and Its Sequelae (Arthrites ostéomyélitiques aigués de la hanche au cours du premier age et leurs séquelles). M. GUILLEMINET, J. BONNET, and G. STRINGA. *Lyon chir.*, 1955, 50: 385.

AFTER REVIEWING some statistical data on the incidence and etiology of septic arthritis of the hip in children, the authors discuss their viewpoint of this affection.

Usually the disease is not recognized early and much can be done by general practitioners in making an earlier diagnosis.

Abscesses develop slowly, are usually large, especially at the dorsal side of the joint, and are often not recognized as having their origin in the hip joint.

The dislocation or subluxation, is according to the authors, secondary to the accumulation of pus in the joint rather than to the destruction of the bone itself. The authors have this impression because the dislocation appears sometimes within the first 7 or 8 days. Next to the acute types, the authors distinguish subacute types of the disease. The diagnosis is much more difficult in the subacute types and the destructive process in the hip joint is just as serious.

The main diagnostic aids for recognizing the affection are the x-rays which may show an increase in the joint fluid, and aspiration of the joint cavity. A differential diagnosis should be made from osteomyelitis of the trochanteric region, which has a benign evolution.

The early treatment advocated by the authors consists of immediate skin traction, antibiotics, and opening of the abscess. Skin traction seems to prevent dislocation.

Treatment of the sequelae depends upon the degree of the deformity. The authors distinguish a complete dislocation with absence of the head and neck, a subluxation in which at times part of the neck and head seems to reappear later, and a third type in which the head takes a shape as it does in osteochondritis.

The operations described are (1) the osteotomy, which should be reserved for older patients, (2) the creation of an acetabular roof, results of which are not lasting, and (3) arthrodesis, which should be performed only in adolescents (between the ages of 11 and 14 years).

The results of arthroplastic reconstruction in very young children (Leveuf 1946) are good during the first postoperative years but not lasting according to the authors. In subluxation this operation should not be performed before the age of 4 because of the possibility of loosing a chance for late development of a partial epiphysis of the head.

Finally, the authors discuss Judet's prosthesis for patients with a frank luxation.

Summarizing the various operations, the authors conclude that in subluxations conservative treatment is best. In dislocations either an arthroplastic reconstruction (Leveuf) for children between 4 and 6 years, or an osteotomy or arthrodesis for children between 10 and 12 years will give the best results.

—*Joseph C. Mulier, M.D.*

Vitallium Mold Arthroplasty of the Hip: End Result Study. GEORGE HAMMOND, HOWARD R. CRAWFORD and G. EDMUND HAGGART. *J. Am. M. Ass.*, 1955, 158: 161.

AN OBJECTIVE and comprehensive study of 104 patients with vitallium mold arthroplasties was made during the past 14 years. The cases were classed as follows:

Name of Condition	*No. of cases*
Osteoarthritis	31
Old congenital hip deformations	28
Unreduced dislocations	7
Acetabular dysplasia with subluxation	21
Complications of fracture of femoral neck	11
Marie-Struempell arthritis	11
Complications of old traumatic dislocation, reduced and unreduced	10
Osteochondrosis of capital epiphysis of the femur	8
Healed pyogenic arthritis	5
Rheumatoid arthritis	4
Idiopathic avascular necrosis	3
Old slipped epiphysis	1
Tuberculosis	1
Otto pelvis	1

The patients ranged in age from 15 to 67 years, 58 per cent being females. There was a significant number in whom the underlying cause of a degenerative arthritis was not clear. The great importance of the patient's mental disposition and ability to co-operate was stressed; the obese patient must be willing to reduce. For patients with difficult physical occupations arthrodesis was preferred. Postoperative care and even a doubtful prognosis is discussed. In a large number of patients with hip disorders conservative measures have often been completely adequate. To carry out arthroplasty for anatomic changes only is very incorrect, and it is believed far wiser to delay this procedure until such time as the findings and symptoms warrant it.

The average total period of hospitalization, including cases with complications, was 74 days, full weight

bearing being delayed until the superior acetabular surface was covered by bone of sufficient firmness.

The postoperative complications following 114 mold arthroplasties in 104 patients were 37 in a total of 28 patients, as follows: thrombophlebitis (7), pulmonary embolism (4), wound infections (9), dislocations (5), subluxation (8), pulmonary atelectasis (4), cerebrovascular accident (1), hematoma (1), peroneal palsy (1), brachial plexus palsy (1), tuberculous sinus (1).

Sixty secondary procedures after 114 mold arthroplasties of the hip in 104 patients were carried out in 34 patients and consisted of the following:

Operation	*No.*
Adductor tenotomy	15
Revision of arthroplasty	13
Second revision	2
Incision and drainage	10
Removal of mold	5
Sequestrectomy	2
Manipulative reduction	3
Venous ligation	2
Obturator neurectomy	2
Section of lateral femoral cutaneous nerve	1
Arthrodesis	3
Second arthrodesis	1
Evacuation of hematoma	1

In some cases a Whitman or Colonna reconstruction was carried out. There was no operative mortality. In evaluating the end-results every patient was required to have had the operation at least 2 years previously, to answer a detailed questionnaire, to be interviewed in regard to all residual symptoms, and to have an anteroposterior and lateral hip roentgenogram. The average follow-up period in this group was 7 years.

Of 82 patients with mold arthroplasties 61 per cent were benefited, 13 per cent showing excellent results, 24 per cent good results, and 24 per cent fair results; 38 per cent had poor results.

The objective factors thought most important were the patients' gait and range of hip motion. Even fair results indicate definite improvement over the preoperative condition of the patient. From their careful and exhaustive study it is the authors' belief that with the careful selection of patients, scrupulous operative technique, and effectual postoperative care, vitallium mold arthroplasty of the hip has a definite place in the treatment of disabilities of the hip joint.

—Ernest H. Bettman, M.D.

The Femoral Head in the Aged; a Study of the Senile Changes and Their Relation to Malum Coxae Senilis (La tête fémorale du vieillard; études de ses transformations séniles et de leurs rapports avec la coxarthrose). P. C. VERAGUTH. *Rev. chir. orthop.*, Par., 1955, 41: Supp. 1.

THE AUTHOR of this extensive article studied 78 normal femoral heads, and tried to determine the normal characteristics of the femoral head in the aged and the relationship of the changes produced by the aging process to the early signs of malum coxae senilis.

Normal changes occurring in the head of the femur of the aged may be summarized as follows:

1. Senile osteoporosis, mainly confined to the nonfunctional regions of the head, where no weight is borne, especially the marginal zones and the region of the fovea centralis. In the weight-bearing portion of the surface of the femoral head, however, the cortex remains thicker and the bony trabeculae of the weight-bearing system remain well developed. This is also well visible roentgenographically.

As a result of long-standing and continuous creeping substitution the porotic femoral head undergoes changes in its shape. A slight but regular flattening of the weight-bearing area and a marginal bulging, or folding, of the subcapital segment appear.

2. Cartilage atrophy, most marked at the margins of the head and the nonweight-bearing portions, while the weight-bearing area remains almost normal. In the weight-bearing area the cartilage takes on a yellowish color, because of a physicochemical process.

3. The replacement of bone marrow, almost completely, by fatty cells. It is poorly vascularized.

It is not correct to consider aging of a joint only in terms of atrophy and degeneration. These changes are the expression of the diminished activity of these tissues. When exercise fails completely in old people atrophic changes are much more pronounced. But if these people continue to walk and bear weight, they develop structural and morphological changes in their femoral head which must be considered normal with regard to their age.

Osteoarthritis of the hip may supervene at any age when there is a "functional disequilibrium" in the joint. Normal aging changes are hindered by this osteoarthritic process. However, the typical signs of aging in the femoral head cannot be considered as the first step toward the malum coxae senilis nor as an etiologic factor.

—Joseph C. Mulier, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

The Phlebographic Pathology of the Postphlebitic Limb. T. O. MURPHY and D. A. FELDER. *Surgery*, 1955, 37: 873.

THE AUTHORS present the results of phlebographic studies with use of a method previously described, in which 83 cases of patients with postphlebitic limbs were studied.

The criteria used for valvular incompetency were: (1) exceptional dilatation of the vein, (2) the presence of one or more incompetent valves in the same area, with dilatation of the vein below the valve, (3) tortuosity, (4) pooling of contrast medium in dilated deep vein varices, and (5) an extensive irregular lumen without visible valve structure.

In studies on the femoral vein, "venous by-passes" were noted in 18 per cent of the cases. The authors consider minor by-passes as consisting of a large collateral running parallel to the primary channel with many short intercommunications, and major by-passes as a large collateral with few or no connections with the primary channel other than its origin and termination. They found that the communicating veins of the leg presented the highest degree of incompetency, and point out that the incidence of venous incompetency seems to be related to the status of the supportive structure of the vein. They do not contend that lack of supporting tone is responsible for the production of an incompetent vein, but that the failure of muscular support is of importance in the progression of the disease.

The authors note that occlusions in the deep veins of the lower legs are associated with large, incompetent, communicating veins acting as collaterals, either temporarily or permanently, and state that if ligation of the superficial by-passes appears to favorably influence the outcome of treatment, then perhaps a ligation of the deep by-passes may also be helpful.

—John H. Schneewind, M.D.

Stasis Ulcers; an Evaluation of the Effectiveness of 3 Methods of Therapy and the Implication of Obliterative Cutaneous Lymphangitis as a Credible Etiologic Factor. CARL A. MOYER and H. R. BUTCHER, JR. *Ann. Surg.*, 1955, 141: 577.

THE PRESENT investigation was undertaken to evaluate three methods of treating chronic ulcers of the legs. The study was restricted to the treatment of ulcers occurring as the result of stasis. The three methods compared were:

1. The injection or ligation of varices and the wearing of Unna's boots, or elastic bandages or stockings.

2. The injection or ligation of varices, the wearing of elastic supports, and the grafting of the ulcer without excision or after its excision, with only a narrow band of surrounding skin.

3. The ligation, excision, or stripping of varices; the immediate split grafting of the cutaneous defect after the excision of the ulcer and all thickened skin and fascia about it; and the wearing of elastic supports thereafter.

Treatment No. 2 was better than treatment No. 1 and treatment No. 3 better than No. 2 and No. 1. With treatment No. 3, the likelihood of failure is greater the larger the ulcer, the greater the number of ulcers, the more evident the postoperative edema, and the poorer the take of the graft, or the slower the epithelization of small localized primary graft failures. Age, sex, nutritional status, history of previous phlebitis, duration and location of the ulcer, the extent of varices, the presence of preoperative edema, and the type of prior therapy had no apparent relationship to the success or failure of treatment. Therapy No. 3 did not make any of the patients significantly worse, even though the treatment was not successful.

The important points of operative technique are: (1) production of hemostasis with absorbable ligatures; (2) the excision includes the base of the ulcer together with all surrounding inelastic skin and thickened fascia, and the defect is immediately covered with a split-thickness cutaneous autograft; (3) the feet and legs must remain upon the bed for 14 to 21 days; and (4) elastic supports are worn indefinitely.

The dermal lymphatics were found obliterated in the skin adjacent to 16 stasis ulcers, but were present and initially dilated in the successful skin grafts used in therapy No. 3. The superficial lymphatics of the grafts soon established connections with the dermal lymphatics of the skin about them. No lymphatics were injectable in areas of graft-takes adjacent to ulcers arising after primary graft-take. To date, no recurrent ulcer has appeared in any area of a graft previously or currently shown to possess lymphatics.

—Robert A. Nabatoff, M.D.

Indications and Late Results of Ligation of the Inferior Vena Cava. JAMES A. KIRTLEY, JR., DOUGLAS H. RIDDELL, and EDWARD C. HAMILTON. *Ann. Surg.*, 1955, 141: 653.

THE RESULTS obtained in 34 patients who have had ligation of the inferior vena cava are presented. The authors' seven indications for ligation are: (1) multiple pulmonary emboli—(a) during anticoagulant therapy and (b) without anticoagulant therapy; (2) massive infarction with obscure origin of embolus; (3) ascending thrombosis of lower extremity above inguinal ligament with embolus; (4) prophylactic ligation during abdominal exploration for some primary condition; (5) accidental trauma to inferior vena cava; (6) septic pelvic thrombophlebitis; and (7) patients with embolism in whom anticoagulants are contraindicated.

The authors believe that any venous ligation at a level lower than the inferior vena cava is not justified. Fourteen of the 34 patients have been followed for 25 to 85 months, and disabling sequelae (edema, ulceration, dermatitis and pain) were found in only 2 patients. Those lower extremities with evidence of throm-

bophlebitis prior to ligation had more unfavorable sequelae than those free of disease prior to ligation. There was no lower extremity morbidity in 14 patients (41 per cent). Normal activity was present in 22 (91 per cent) of the 24 patients who remained alive. Immediate ligation of the vena cava in patients with massive embolism was associated with a high operative mortality. Extraperitoneal ligation of the inferior vena cava combined with exploration of the abdomen is suggested in patients with pulmonary embolism resulting from spontaneous thrombophlebitis. "The low incidence of late, deleterious effects of vena caval ligation should encourage its use when a true indication for ligation exists." —*Robert A. Nabatoff, M.D.*

Ligation of the Middle Third of the Inferior Vena Cava; an Experimental Study (Sulla legatura sperimentale della vena cava inferiore al terzo medio). PAOLO BAGOLAN and ALDO DE MARIA. *Ann. ital. chir.*, 1955, 32: 3.

THE PURPOSE of this work was to study the development of collateral venous channels after complete and sudden occlusion of the inferior vena cava.

The study was carried out on 16 dogs. The vena cava was ligated with silk. In several instances the vessel was divided between ligatures. All the animals survived and had completely recovered from the procedure at the end of the first postoperative week. During the first three postoperative days there was moderate elevation of the blood urea with subsequent return to normal. Immediately after the ligation the venous pressure in the inferior vena cava rose from a normal of 15 to 22 cm. of water to a peak of 100 to 110. The pressure then decreased rapidly and after half an hour had come down to levels of around 30 to 40 cm. At the end of the first postoperative week the venous pressure in the inferior vena cava system had returned to its previous level.

Phlebograms done at various intervals after the procedure showed the development of a marked collateral system in which the branches of the renal and inferior vena cava veins participated, as well as the intercostal, azygos, and vertebral veins, the latter being the most constant and the most important. The superficial veins of the abdominal wall also took part in the collateral venous circulation.

The authors conclude that sudden ligation of the inferior vena cava is a feasible procedure. Furthermore since the adrenal, spermatic, and ureteral veins play an important role in the development of a collateral circulation it would be wise to include these vessels in the surgical excision of a malignant tumor of the kidney, since occlusion of the renal vein and inferior vena cava by tumor invasion often takes place.
—*René B. Menguy, M.D.*

The Development of Collateral Circulation Following Ligature of the Inferior Vena Cava; an Animal Experimental Study (Die Entwicklung des Kollateralkreislaufs nach Unterbindung der unteren Hohlvene; Eine tierexperimentelle Studie). WERNER KOTHE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 261.

IN VIEW of the small number of experiments which have been performed with ligature of the inferior vena cava in living animals, a study, on dogs, was made to determine the tolerance to this procedure, the sequelae, and the manner and time of development of a collateral circulation. Ligation of the inferior vena cava with perlon, under ether narcosis, was well tolerated. Ligation of the inferior vena cava above the insertion of the renal veins resulted in death due to renal insufficiency within a few days. Ligation between the insertion of the renal veins and the bifurcation produced no significant disturbance in the venous system.

Due to numerous anastomoses, the collateral circulation appears directly following ligation. The rate of flow of the blood slows up at first, because the collateral paths are caught unprepared. After about 6 days, the collaterals have become so dilated that no significant circulatory disturbance remains. After about 8 weeks, the collateral circulation is functioning completely and is limited to only a few large veins.

To avoid errors in interpretation, the animals used in the present study were killed 12 weeks following ligation, and autopsied. The venous system was then filled with hematoxylin through the femoral vein for observation.

These experiments appear to throw some light on the problem of functional physiologic conditions during the development of venous collateral circulation. Of course, the results in animals cannot be applied literally to conditions in the human subject. They do, however, permit the conclusion that ligation of a large body vein, such as the inferior vena cava, below the insertion of the renal veins is a safe procedure. It is the author's opinion that a similar collateral circulation would develop within the same short period in human subjects, owing to the presence of numerous anastomoses, and without serious sequelae.
—*Edith Schanche Moore*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Clinical Experience with the Intravenous Infusion of Emulsified Fat. WILLIAM R. WADDELL, ROBERT P. GEYER, RUSSELL OLSEN, STEPHEN B. ANDRUS, and FREDRICK J. STARE. *J. Laborat. Clin. M.*, 1955, 45: 697.

THE PROBLEMS associated with the introduction of colloidal material into the blood stream include stability, pyrogenicity, and vasomotor and allergic reactions, to mention a few. The utilization of intravenous fat, the methods by which it leaves the blood, and its effect upon hepatic functions have been studied. The report concerns the results of 1,466 infusions of fat emulsions in 426 patients.

The incidence of thermogenic responses to the infusion of emulsified fat has been one of the major difficulties that has confronted workers in this field. Numerous factors have been alluded to as possible sources of thermogenic reactions.

One hundred and fifty-one different emulsions were used in patients, who as a group were severely ill, the majority suffering from gastrointestinal tract neoplastic disease or intra-abdominal infection. Pyrogenic response was the most frequently observed untoward response, characterized by a sharp rise in the body temperature and chills. Reactions due to the introduction of colloids into the blood stream consisted of flushing and warmth of the face and neck, apprehension, sensation of constriction or oppression in the chest, cyanosis, and severe pain in the back. This train of events occurred but a few times. The symptoms lessen in 2 to 3 minutes after the infusion is stopped and in 5 to 10 minutes they disappear altogether. In most instances the infusions can be resumed after 20 minutes or the next day without any untoward reactions. Antihistaminics given with the fat infusion have not lessened the incidence of these reactions. Vasomotor changes, which occurred frequently, involved a rise in the systolic blood pressure and moderate elevations of the pulse rate. The results were analyzed relative to the incidence of chills, pyrogen, and colloid reactions and there was definite improvement from a pyrogen standpoint with the use of cottonseed oil and synthetic triolein. Emulsions of coconut oil and coconut plus olive oil gave almost as good results. Soya bean phosphatides have been consistently the most efficient emulsifier that the authors have found among materials suitable for clinical use. All the emulsions used clinically have contained this preparation as the principal emulsifying agent. Its disadvantages are its vasomotor effects and its chemical complexity and reactivity. Increasing concentrations of the phosphatide result in a higher incidence of undesirable side effects.

One of the possible explanations for the fact that 5 to 15 per cent of the infusions resulted in pyrogenic reactions was that the individual abnormalities of certain patients was responsible. The phospholipid used in the emulsions reacts with the blood proteins and the total serum protein; therefore, the albumin-globulin ratios were studied. It was found that these levels did not determine whether or not a thermogenic reaction would occur. It is also shown that the incidence of thermogenic responses is higher in postoperative patients. No significant change in the incidence of pyrogen reactions resulted when pyribenzamine was added directly to the fat emulsion infusions.

The authors conclude that emulsified fat can be given successfully to patients with safety and with a minimum of undesirable side effects. Purified cottonseed and synthetic oils were particularly encouraging, giving the lowest incidence of pyrogen reactions, approximately 3 and 6 per cent, respectively.

—*James H. Holman, M.D.*

Clinical Experiences with Parenteral Honey Therapy (Klinische Erfahrungen mit parenteraler Honigbehandlung). H. DITTRICH. *Muench. med. Wschr.*, 1955, 97: 593.

THE AUTHOR discusses the metabolism of fructose (levulose) as compared with that of dextrose. Dextrose is broken down under the influence of hexokinase. This process is inhibited by anterior pituitary extract, whereas insulin counteracts the inhibition. The breakdown of fructose, however, takes place independently of hormonal influences, especially of insulin. The respiratory quotient is increased after the administration of levulose, which indicates acceleration of the metabolism in the citric acid cycle. This leads to the increased production of adenosin triphosphoric acid which, in turn, causes increased activity of glucokinase. Thus, the intensified dissimilation of sugar caused by fructose is essential for the increase of phosphorylation of glucose. The increased production of adenosin triphosphoric acid is one of the most important biologic effects of fructose therapy as this compound participates directly or indirectly in all energy-consuming processes of the body.

These physiologic considerations led several workers to recommend simultaneous parenteral administration of dextrose and levulose.

Honey contains from 30 to 35 per cent of dextrose, 35 to 40 per cent of fructose, and 5 per cent of sucrose; it, therefore, constitutes an ideal mixture for intravenous therapy in disturbances of the myocardium and the liver. Other workers found in animal experiments that honey is far superior to glucose in myocardial damage; it intensifies considerably the blood supply of the heart and increases the stroke volume.

In this article the author reports on experiences with intravenous honey therapy in a group of 100 patients with cardiac and hepatic disturbances, including atherosclerosis, angina pectoris, different types of hepatitis, and liver cirrhosis.

For the treatment of cardiac patients a preparation was given containing ⅛ mgm. of strophanthine and 20 mgm. of thiamine hydrochloride in addition to purified honey. One or 2 ampuls were given daily for 10 to 14 days. The effect was quite satisfactory and definitely superior to intravenous glucose treatment.

The hepatic patients were treated partly with pure honey solutions in various concentrations and partly with honey solutions enriched by vitamin B complex. The success in these patients was less marked than that in cardiac patients.

No information is given in this article as to the amount of honey given in each injection nor as to the concentration of the honey solutions.

—Werner M. Solmitz, M.D.

The Management of Postoperative Pseudomembranous Enterocolitis with Shock; Report of a Case with Recovery. OLE T. JONASSEN, SIDNEY M. FIERST, and JOHN J. CINCOTTI. *N. England J. M.*, 1955, 252: 792.

THE SYNDROME known as pseudomembranous enteritis, staphylococcal enterocolitis, or acute necrotizing enteritis has rarely been described until recently and the authors point out that its apparent increase seems to coincide with the greater use of the broad spectrum antibiotics, especially the tetracycline derivatives. The depression of the normal bacterial flora upsets the natural balance and may produce a fertile field for the unrestricted development of certain resistant virulent bacterial strains. Coagulase-positive hemolytic staphylococci have been incriminated in the fulminating cases of enterocolitis.

Pettet *et al.* have emphasized the fact that pseudomembranous enterocolitis is not due to the effects of the antibacterial drugs on the intestinal flora. They reviewed the histories of 94 patients who died in the postoperative period with extensive pseudomembranous inflammation and found that this syndrome had not become significantly more frequent in recent years.

The authors suggest that the antibiotics play only a subsidiary role in the onset, and speculate that an enterotoxic strain of the staphylococcus is given uninhibited opportunity to exert its effects by the suppression of the other bacteria by antibiotics. Another possibility put forth is that this acute necrotizing reaction is a hyperergic response of an organ sensitized to that particular bacterial allergen—a type of Shwartzman phenomenon.

A case report is presented in detail of a patient who recovered from a postoperative staphylococcal enterocolitis after the onset of shock.

The first stage in treatment is concerned with restoration of the blood pressure to normal, the restoration of fluid and electrolytes, and the discontinuance of broad-spectrum antibiotics. The mechanism of shock in these cases is not known. The replacement of fluid and electrolytes alone will not prevent death from shock. Therefore, the administration of norepinephrine in adequate dosage to maintain the systolic blood pressure is important. The amount of fluid loss may range from 10 to 20 liters a day and this must be replaced. The intravenous insertion of polyethylene tubes enables the administration of large amounts of fluid. Daily determinations of serum carbon dioxide, chloride, sodium, and potassium are essential. Erythromycin is the most effective drug against staphylococci, although a rapid increase in the number of resistant strains is being noted. Even before specific bacteriologic data are at hand, erythromycin should be started. Bacitracin may also be used. Alterations in fecal bacteria should be followed by frequent stool cultures, and when an organism is isolated, its sensitivity to the various antibiotics should be determined, so that the most effective drug can be given.

The second phase of treatment is concerned with supporting the patient during the reparative stage. The great loss of protein requires repeated transfusions of whole blood and the administration of human serum albumin. Caloric requirements can be met in part by the intravenous administration of 10 per cent dextrose until the patient is able to eat. ACTH may be used to enhance the appetite.

The danger of disseminating infection may preclude the use of ACTH in the early phases, but ACTH can be administered safely when the infection has been controlled.

Since the alteration of the normal bacterial flora of the gastrointestinal tract during the use of wide spectrum antibiotics has been held responsible for the emergence of pathogenic staphylococci en masse, restoration of the normal flora may be aided by the use of any preparation containing lactobacillus.

During the later period of convalescence forced feedings of high-caloric and high-protein diet with supplements of vitamins and crude liver extract will hasten recovery.

The administration of testosterone has been reported as an aid in restoring the positive nitrogen balance by improving the anabolic processes.

—Robert Paradny, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Research in the Field of Accidental Trauma. ROSS A. MCFARLAND. *Mil. Med.*, 1955, 116: 426.

THE LOSS OF LIFE and incapacity resulting from accidents are greater than from any known disease entity. Accidents are currently responsible for the deaths of some 100,000 persons annually in the United States. About 400,000 more are permanently disabled in some degree. Ten million people are injured each year in accidents, to the extent of one or more days of disability. Accidents are number one among the causes of death in the age range from 1 to 24 years, and are second in the age range of 25 to 44 years. In the armed services, every fifth death was related to trauma away from battle.

Many studies on the causes of accidents have indicated human failure of some kind or other as the chief cause. Although it is widely assumed that older workers constitute a safety hazard in industry, research into this problem does not support this view. Highway studies clearly indicate that accident hazards are higher in the younger age groups, with lower rates of accident pertaining when about the age of 30 is reached. This same trend was discovered in studying the ages of truck drivers in relation to accidents. With age and experience, safety increases.

It has been shown that one of the most important ways of improving safety is to design equipment in terms of human capabilities and limitations. This is the special province of the human engineers. Equipment for human use must be designed on the basis of an understanding of the sense organs and characteristics of human perception, and of human capabilities

and limitations in the operation of tools. This understanding must extend to situations of operating under temporarily impaired efficiency, as with fatigue, environmental conditions normally encountered, and the more unusual situations of special stress. The advanced analysis of equipment in these respects should result in fewer accidents. —*Matthew H. Evoy, M.D.*

Nutrition Studies in the Severely Burned. T. G. Blocker, Jr., William C. Levin, W. W. Nowinski, S. R. Lewis, and Virginia Blocker. *Ann. Surg.*, 1955, 141: 589.

The vicious cycle of progressive malnutrition as encountered in patients with a severe burn injury is reiterated. The exceptionally high levels of caloric and nitrogen intake necessary to meet the requirements for reparative processes are pointed out. In severely burned patients the rate of protein catabolism is greatly augmented. Even though experimental work would tend to indicate that the rate of protein anabolism is also greatly accelerated, nitrogen equilibrium does not obtain. The usual nutritional changes which occur following a burn injury for which skin coverage can be accomplished quickly are:

1. Initial positive nitrogen balance.
2. Negative nitrogen balance with increased urinary nitrogen excretion until the end of the second or third week.
3. Gradual restoration of the positive balance with daily variations according to the intake.

If complications occur, there tends to be a prolonged phase of metabolic imbalance or death.

Fifty-three per cent of the patients whose body surface burn exceeded 20 per cent were considered to be nutritional problems. Forced protein feeding was initiated by means of a polyethylene tube and a constant gastric drip. Following the cessaton of tube therapy, supplemental protein formulas were administered. The amount of protein which could be given depended upon the level of individual tolerance, the extent of ambulation permitted, the degree of total skin involvement, and the efficiency of the attendant nursing staff. No toxic reactions to protein were observed, but the occurrence of severe diarrhea, anorexia, and vomiting in a patient who had previously shown good progress are indications for at least temporary cessation of forced feeding measures. The patients with acute full-thickness burns who were not ambulatory lost weight with a diet which contained less than 2 gm. of protein and 35 calories per kilogram of body weight. If the intake was between 2 and 4 gm. per kilogram with 45 to 85 calories per kilogram, the weight was maintained. Chronically burned individuals who have suffered considerable weight loss require and will tolerate larger amounts of protein and caloric intake. Good results were obtained with a ratio of calories to nitrogen varying from 85 to 1 to 120 or 130 to 1. Large amounts of supplemental vitamins are included in the diet, and 3 to 4 gm. of potassium chloride were begun on the fourth or fifth day if the urinary output was adequate. Five illustrative case reports are presented with metabolic balance charts to indicate the changes which occur. The authors also point out the persistence of a low albumin-globulin plasma protein ratio in spite of a rising total protein level. The study of the electrophoretic pattern of the protein indicates that the gamma-globulin fraction increases considerably and that alpha $_2$ and beta fractions run parallel in content but in reverse proportions to the gamma fraction.

The authors conclude that intensive forced feeding of burned patients with a high caloric, high nitrogen formula is important in combating the negative nitrogen balance after the first week of injury. Large quantities of these foods are necessary to maintain weight in the burned individual. Experiments using 1-methionine labeled with radioactive sulfur indicate that there is a protein disequilibrium following a burned injury associated with both an increase in the catabolic and anabolic functions, the disequilibrium resulting from excessive increment in the catabolic rate.

—*Jerry A. Stirman, M.D.*

Treatment of Burns Resulting from Disaster. John L. Enyart and Donald W. Miller. *J. Am. M. Ass.*, 1955, 158: 95.

This article concerns the manner in which the Newport Naval Hospital, Rhode Island, cared for mass burn casualties resulting from the explosion aboard an aircraft carrier, the U.S.S. Bennington. Seventy-four patients were admitted with burns varying from 2 to 100 per cent of their body surface. Several of these patients had additional injuries such as fractures. Twelve of the 74 died. The hospital was informed of the disaster 3 hours before admission of the first patient, and during this interval a staff meeting was held and individual responsibilities were assigned. A standardized program of treatment was presented in order to obtain maximum efficiency and uniformity in handling the casualties. Staff meetings were continued thereafter at 8 A.M. each day, at which time the procedure for the day was outlined and any problem that arose on the preceding day was discussed.

The treatment of the burned patients was standardized to include the administration of blood and electrolytes to combat shock, exposure treatment of burn surfaces, the administration of antibiotics in high dosage, tracheotomy for laryngeal burns, Levine tube suction for gastric dilatation, early skin grafting, and the maintenance on a high caloric, high protein, high vitamin diet. A rapid distributional shift of body fluid and electrolytes occurs when a considerable body area is burned. Normally, the total circulating blood volume accounts for approximately 8 per cent of the body weight and the extracellular fluid accounts for an additional 12 per cent. After a burn there is a rapid distributional shift of fluid into the tissue beneath the burn, which becomes evident as clinical edema, and, in addition, there is considerable loss of exudate from the burn surface. In the untreated burn this fluid is obtained from the extracellular space elsewhere in the body and from the circulating blood.

The loss of fluid from the blood causes hemoconcentration with rising hematocrits and a reduction in the total circulating blood volume. Clinical shock results, and blood and plasma expander solution are needed to restore the blood volume to normal.

The shock that developed from these physiological changes was treated by the administration of blood and electrolytes in accordance with their modification

of the Evans formula. During the first 24 hour period an amount of isotonic sodium chloride solution was administered that was equal to the body weight in kilograms times the per cent of the body burn, 50 per cent as the maximum figure for this calculation. An equivalent amount of plasma expander was also administered intravenously during the first 24 hours, with the intention that half of it would be blood and the other half dextran or serum albumin. No plasma was used, as none was available that was free of the homologous serum jaundice hazard. Administration of isotonic sodium chloride solution, blood, dextran, and serum albumin was continued during the second 24 hour period, but in half the amounts of the preceding day. In addition, half normal saline solution or a half normal solution of sodium bicarbonate, sodium citrate, and saline solution was also given orally to the patients who would tolerate oral intake. At the end of the first 48 hours all sodium chloride administration was discontinued and glucose in water solution was administered instead in amounts sufficient to maintain hydration until the period of diuresis was completed.

All patients with burns of more than 25 per cent of their total body surface were placed on a regimen of bladder drainage with indwelling Foley catheters and the intravenous therapy was administered fast enough to keep the urinary output at approximately 50 c.c. per hour. Thus, a glance at the urine bottle accurately reflected the patient's response to treatment.

In applying the electrolytic replacement formula, the body surface areas were calculated by the rule of "9."

The burn surfaces were treated by the exposure method. No attempt was made to cleanse or débride the burn surface until the patient's condition became stabilized and the output of urine was satisfactory. This usually took a period of 12 hours, but in some cases no débridement was done for 24 to 36 hours. Débridement consisted of general cleansing with phisohex and irrigation with normal saline solution. Blisters were left intact and only loose edges of the skin were removed. The only anesthetic used was morphine, demerol, or nisentil. By exposure to the open air the burn surface gradually became dry, and a protective coagulum formed by the end of 48 to 72 hours. When the burns were circumferential the patient was turned every 6 hours. The burns were inspected daily and any infected areas were débrided. In superficial split-thickness burns the coagulum peeled off in 10 to 14 days leaving a nicely healed surface beneath. Deeper split-thickness burns required about 3 weeks to peel.

Eschars formed over third degree burned areas more rapidly than the coagulum over split-thickness areas and remained intact for about 14 days. The eschars gradually began to separate, leaving moist wounds, and daily dressings were then instituted. Once the separation began, the more rapidly the eschars were removed and the sooner lay-on grafting could be instituted. Thus, the eschars should be either surgically or enzymatically débrided. Some patients were taken to the operating room for complete immediate débridement under anesthesia, but on most of the patients débridement was gradually done in the wards as the eschar separated, under only alphaprodine analgesia. Proteolytic enzymes were used to some extent with fair results.

Antibiotics were used routinely in all cases, starting with penicillin and streptomycin for 5 to 7 days, and thereafter antibiotics were given on the basis of culture sensitivity. Vigilance was maintained for early respiratory distress and tracheotomy was instituted at the first sign of difficulty. Respiratory irritation from flame and smoke was common, but in most instances aerosol therapy was successful.

Third degree burns were grafted, and it was found most satisfactory to do this grafting between the tenth and the fourteenth days. Strips of even sheets of skin were used over joint surfaces and small "postage stamp" grafts were used over other surfaces.

—Ely Elliott Lazarus, M.D.

Fat Embolism Following Accidents (Fettembolie bei Verkehrsunfaellen). G. SÄKER. *Muench. med. Wschr.*, 1955, 97: 625.

IN 95 OF 100 FATAL ACCIDENTS resulting in skull fractures, fat embolism was found at postmortem examinations. It was massive in 59 per cent and involved the greater circulation in 23 per cent.

The gravity of brain injuries attracts the attention of the surgeon to such an extent that fat embolism is overlooked or cannot be recognized because its signs are overlapped by those of the concomitant cerebral trauma. Thus, the sequelae of fat embolism may be ascribed to brain injury while in reality the reverse may be true, namely, fat embolism, if it involves the lungs, may lead to hypoxemia, asphyxia, and cardiac failure, which in turn may be responsible for functional and morphologic changes in the brains, such as hypoxia and cerebral edema.

Unfortunately, chemical detection of fat embolism yields unsatisfactory results.

Fat embolism may occur as a sequel of an accident without a fracture. In one-third of the author's series no fractures of the trunk or extremities were present. In 32 of the 35 cases of this type skull fractures were present, but they could not have been responsible for fat embolism because the cranium contains very little fat marrow. Undoubtedly, not only mechanical dissemination of the fat particles but also colloidochemical changes are an important factor in the genesis of fat embolism.

The clinical picture of pulmonary fat embolism is not pathognomonic and is characterized by anxiety, oppression over the chest, tachypnea, dyspnea, slight cyanosis, shock, and tachycardia.

Massive fat embolism cannot be influenced therapeutically. The customary treatment of collapse with oxygen inhalations, plasma volume replenishers, vitamin C, cortisone, noradrenalin, and cardiac stimulants is valuable for the prophylaxis of fat embolism.

—Joseph K. Narat, M.D.

Posttraumatic Dystrophy. J. BONNET. *Arch. chir. Neerl.*, 1955, 7: 37.

A CAREFUL ANALYSIS of some hundred cases of posttraumatic dystrophy led to a classification in four stages, which considerably differs from that usually encountered in the literature.

The first stage is characterized by vasodilatation; its symptoms are hypertrichosis and finely spotted decalcification of bone in addition to a warm, dry, and edematous skin.

The second stage is characterized by vascular lability and a corresponding fluctuation in clinical manifestations.

The third stage is characterized by virtually constant vasoconstriction and atrophy of all tissues.

The fourth stage is a rest stage with normal circulation and manifestations to be regarded as residual from preceding stages.

Treatment is discussed on the basis of this classification and with reference to personal experience.

Satisfactory results were obtained by systemic injection of procaine, to which adrenalin was added, into the trigger points and the sympathetic nerves. Ganglionic sympathectomy was resorted to only in the most serious cases; the results were striking.

The etiology is discussed with reference to the literature. The hypothesis is made that the cause of the condition is a variable sensitivity of the peripheral blood vessels to sympathetic stimuli under the influence of regional reflexes, edema, and fibrosis.

—*John J. Maloney, M.D.*

The Prognosis of Acute Suppurative Infection of the Flexor Tendon Sheaths of the Hand. HUGO ARONSSON. *Acta chir. scand.*, 1955, 109: 58.

IN ORDER to show the improvement noted in the prognosis of suppurative flexor tendon sheath infections and to determine the reasons for this improvement, the author reviewed a series of 411 cases selected from the Industrial Injuries Insurance Office of Sweden. The series covers a period of 25 years, from 1929 to 1953, and includes only those cases with a resulting disability of 10 per cent or more. The average disability was from 15 to 20 per cent.

According to the records, a substantial improvement was noted. In the first 5 years of this study, the average incidence was 57 cases per year; in the second 5 year period, the incidence dropped to 15 cases per year; in the third 5 year period, to 7; in the fourth 5 year period, to 2; and in the fifth and most recent 5 year period there was only 1 case per year.

The reasons for this improvement include the use of sulfa and penicillin; preventive measures; improvement in surgical treatment; and earlier medical attention. The remarkable improvement which occurred in 1933 to 1935, before the institution of sulfa and penicillin therapy, is difficult to explain. However, the author believes that a tendency for patients to seek treatment earlier is significant in this regard.

Acute tenosynovitis of the flexor tendon sheath has nearly disappeared as a major disabling factor. In view of this remarkable change of prognosis in this specific infection, the author concludes that there has been marked improvement in the prognosis regarding other septic infections.—*Victor M. Bernhard, M.D.*

The Treatment of Tetanus (A propos de traitement du tétanos). P. DECKER. *Helvet. chir. acta*, 1955, 22: 99.

THE THERAPY of tetanus comprises (1) treatment of the infected wound, (2) the administration of antitoxin, and (3) symptomatic measures.

Toxin fixed in cells is not affected by circulating antitoxin, which, furthermore, has no bactericidal effect nor the power to reduce the amount of toxin produced by tetanus bacilli.

The symptomatic treatment, which recently consisted of the employment of barbiturates, chloral hydrate, and avertin, was apt to reduce respiration and thus create hypoxemia or hypercapnea. Cortisone, although not a specific remedy, gives the patient suffering from tetanus time to recover. In addition to cortisone, our armamentarium has been enriched by: (1) curare or similar drugs, such as myanesin and flaxedil, (2) artificial hibernation which reduces the metabolism and especially the need for oxygen, and (3) artificial respiration combined with tracheotomy which assures sufficient ventilation of the lungs.

The author refrains from using artificial hibernation in the treatment of tetanus because it is risky to maintain this condition over a period of several days and because a sufficient relaxation of muscles without dangerous depression of the vital functions is difficult to obtain.

Of 9 patients treated with myanesin, 2 died soon after admission to the hospital. A delay in performing tracheotomy and instituting artificial respiration was probably the cause of the fatal outcome.

Repeated analyses of blood gases are essential for the estimation of respiratory insufficiency in a patient in whom an iron lung is employed. Blood electrolytes should also be repeatedly determined and roentgenograms of the chest should be taken daily to judge the efficiency of the assisted ventilation.

Proper treatment of tetanus requires collaboration of a surgeon, internist, laryngologist, and anesthesiologist. —*Joseph K. Narat, M.D.*

The Continuing Problem of Infection and Gangrene in the Diabetic Extremity. CHARLES W. MCLAUGHLIN, JR., and CHARLES F. HEIDER, JR. *Am. J. Surg.*, 1955, 89: 964.

DURING THE past 20 years at the University of Nebraska, 7 per cent of the patients admitted with diabetes had evidence of infection and gangrene. Approximately 90 per cent of the patients had only fair or no prior treatment for the diabetic state. Although there was a predominance of males in the group, the average age was 61 years for both sexes. Twelve per cent of the patients had not had a previous diagnosis of diabetes mellitus made.

During the past 5 years the incidence of unknown diabetes has diminished appreciably. At least 40 per cent of the patients had some precipitating factors in the occurrence of the gangrene. In the first 10 years of the study extensive gangrene of the toes and foot, extending into the leg, was the most common lesion encountered. The highest percentage of lesions noted was associated with penetrating ulcers (approximately 31% of the admissions). Conservative treatment alone or combined with conservative surgery was instituted in more than one-half of the entire series with a constant mortality of about 10 per cent.

During the past 10 years, with the progressive lowering of the mortality rate from major amputation, an increasing number of patients were treated with more radical surgery. Many patients who had been treated

by conservative methods, either surgical or medical, eventually required major amputation after a long period of hospitalization. In 4 patients who were treated with a primary major amputation and subsequent reamputation the mortality rate was 50 per cent. A midthigh amputation with short anterior and posterior flaps was the most common procedure employed in the entire series. It was preferred because of the lower percentage of wound infection and the relatively short operating time necessary. In the early part of the series more than 60 per cent of the wounds became infected following the amputation. More recently this figure has been less than 20 per cent.

The importance of lumber sympathectomy is not completely evaluated in this series. The authors indicate that lumbar sympathectomy may have a more important place in the prophylactic treatment of the remaining limb following the amputation of the contralateral extremity.

The average length of hospitalization for the entire group was 46 days. Because most of the patients are indigent, the prolonged hospitalization becomes a responsibility of charity or of the taxpayer. The hospital mortality rate was 16.3 per cent. During the earlier years the over-all mortality rate was 22.6 per cent. This rate has been decreased to 10.2 per cent in the past few years.

The authors conclude that prophylactic therapy, chiefly meticulous care of the extremities, and control of the diabetic state, are the most important factors in reducing the incidence of diabetic gangrene. Prompt radical surgery has reduced the mortality and length of hospitalization. Close co-operation between experienced and interested internists and surgeons is needed to further reduce the mortality and morbidity. Lumbar sympathectomy may be of value in selected cases.

—Jerry A. Stirman, M.D.

Surgical Lesions of Coccidioidomycosis. H. D. Cogswell, E. W. Czerny, and J. M. Fritz. *Arch. Surg.*, 1955, 70: 633.

Human coccidioidomycosis is a disease resulting from infection by the fungus Coccidioides immitis. It is usually acquired by inhaling the chlamydospores of the fungus, which are carried in the dust. Entry can occasionally occur through abrasions and lacerations. Infection by ingestion does not occur. The incubation period varies from one to 3 weeks. After the spores have entered the host, usually lodging in the lung, they round into spherules and divide into segments which develop into the characteristic endospores with a double refractive wall. The fungus spreads in the host by rupture of the spherule wall which releases the endospores, which grow into mature spherules. These may be carried by the blood or lymphatics to distant organs.

The initial primary infection is usually self-limited to the lung area. The progressive secondary disseminated infection apparently results from a fungus septicemia and affects many parts of the body with coccidioidal granulomatous lesions. Apparently, a third stage should be added to the first two. In this stage, the lesions are usually singular. The cases studied have seemingly gone through the primary and secondary stages, the fungus finally localizing in one or more viscera. Probably, host resistance prevented the secondary stage from becoming fatal, yet the fungus retained sufficient virility to localize in various viscera, and to cause persisting symptoms.

Of the primary cases, only 40 per cent are symptomatic. The most common symptoms are fever, pleurisy, malaise, arthralgia, anorexia, and night sweats. Erythema nodosum or erythema multiforme is fairly common.

The large majority of infections is not seen by surgeons, the disease being treated symptomatically. In rarer cases, surgical intervention is necessary as the infection progresses. Chest lesions most commonly need surgical treatment. The indications for surgical treatment of pulmonary coccidioidomycosis are:

1. Spontaneous pneumothorax with a nonexpansible lung.
2. Gross hemoptysis in the presence of a persistent cavity.
3. Solid tumor of the lung in older patients that cannot be definitely diagnosed as coccidioidomycosis.
4. A large, blocked, or expanding cavity.

Segmental resection, lobectomy, or decortication are the procedures usually undertaken.

Coccidioidal infection in extrapulmonary organs, while common in the disseminated form, is rare otherwise, and represents residual infection after the disseminated coccidioidomycosis has stabilized itself. In this category, bone lesions are usually the most common in patients who have survived the period of dissemination. The lesions are serious, sometimes requiring amputation because of osseous fistulas, pain, deformity, and disability. At present, immobilization, rest, and occasional incision and drainage is the treatment of choice.

Very few residual lesions are reported to have occurred in areas other than the lungs and bones. These also represent the tertiary stage of coccidioidomycosis. Of 3 patients with infection of the pelvic organs whose cases were reported in the literature, only 2 have recovered.

The diagnosis is often not made immediately, because of the bizarre symptoms which appear at the time of dissemination. In endemic areas, however, awareness of the disease makes early, rapid, and accurate diagnosis possible. Patients with undiagnosed disease, who have been in the southwest endemic areas, should be subjected to coccidioidomycosis diagnostic tests. Tuberculosis is the disease most often mistaken for coccidioidomycosis.

Since symptomatic treatment offers so little, a specific antibiotic drug is needed to save patients suffering from coccidioidal dissemination from death or prolonged maiming illness.—*Samuel Kahn, M.D.*

ANESTHESIA

Induced Hypotension During Anesthesia and Surgery. David M. Little, Jr. *Anesthesiology*, 1955, 16: 320.

The methods of inducing hypotension consist of reduction of the circulation blood volume by arteriotomy or by a vacuum applied to the lower extremities, or by decreasing peripheral resistance by a total spinal block, epidural block, or sympathetic ganglionic

blocking agents. The more widely used agents in the last group are hexamethonium, pentamethonium, pendiomid, a diethylenediamine derivative, and arfonad, a thiophanium compound with a very short action.

To determine the frequency of complications resulting from the use of controlled hypotension, the author sent questionnaires to 1,400 members of the Association of Anaesthetists of Great Britain and Ireland and to diplomates of the American Board of Anesthesiology. In the replies, a total of 27,930 cases were reported, of which 55 per cent were conducted with methonium compounds; 34 per cent with total spinal block; 1.5 per cent by arteriotomy; 1.3 per cent with arfonad; and 0.2 per cent with pendiomid. In 72 per cent of the cases an attempt was made to reduce the arterial pressure to 80 mm. Hg or below. It was shown, by statistical analysis of the questionnaires, that the incidence of major complications is significantly higher when the blood pressure is reduced to 80 mm. Hg or below than when the arterial pressure is kept above that level.

There were complications in 908 cases, a high rate of 1 with complications in every 31 cases. The most common important complication was reactionary hemorrhage, which occurred in 243 cases. Suppression of kidney function occurred 106 times. Fifty patients developed thromboses of various essential arterial supplies. Cardiac arrest or cardiovascular collapse occurred on 58 occasions and was frequently followed by death. There were 96 deaths, a mortality rate of 1 in 291 patients. Compromising the circulation to vital structures accounted for more than 50 per cent of the deaths. Reactionary hemorrhage caused 8 deaths, while the techniques themselves were at fault in the cases of 5 patients who died following high spinal anesthesia.

Contraindications to controlled hypotension are cardiovascular, hepatic, or renal disease, extremes of age, disturbances of blood volume, and uncomplicated, elective surgery.

Because of the high incidence of complications, as shown in the questionnaires, the author evolved a modified technique, and he presents 2 cases in which this technique was employed. The blood pressure is lowered to the minimal extent compatible with the control of bleeding, and maintained at that lowered level the shortest time consistent with adequate accomplishment of the surgical procedure. Significant reduction in the vascular ooze was frequently noted at pressures of 90 to 100 mm. Hg. 0.1 per cent arfonad was used in intravenous drip because of its evanescent action which allows minute-to-minute control of the degree and duration of the hypotension. This permits rapid termination of the hypotension at the end of surgery, or in the presence of hemorrhage. The operative site is placed superiorly.

Indications for controlled hypotension are the control of gross hemorrhage or extensive ooze, a bloodless field for visibility, as in the Lembert fenestration operation, reduction of organ tension as in craniotomy, reduction of intravascular tension for surgery of the heart and great vessels, and control of hypertensive crises, as in the removal of pheochromocytoma.

—*Rosemary Susat, M.D.*

Nitrous Oxide-Oxygen Curare Anesthesia for the Geriatric Patient: an Electrocardiographic Study. MORRIS L. HELLER, JAN NYBOER, and ROBERT C. STORRS. *Current Res. Anesth.*, 1955, 34: 121.

POOR RISK patients and geriatic patients always present a serious problem in the selection of a general anesthetic agent. The authors believe this problem is best solved by the use of light anesthesia with nitrous-oxide-oxygen and curare, which produces a low incidence of cardiac complications.

Nitrous oxide was selected because of its nontoxic properties. It produces central nervous system depression without depressing the heart or other vital organs. There is rapid recovery from anesthesia followed by minimal postanesthetic depression.

It has been stated that light plane anesthesia is harmful because autonomic reflexes are not suppressed, but the authors found that beneficial protective physiologic mechanisms are well preserved under light planes of anesthesia with nitrous-oxide-oxygen and curare. Light anesthesia appears to prevent vagal and celiac plexus reflexes.

Electrocardiograms were taken on 53 patients during nitrous-oxide-oxygen-curare anesthesia. The ages ranged from 60 to 90, and most of the patients had some type of cardiac disease. Forty-nine major operations were performed, 18 being procedures on the upper abdomen. The duration of anesthesia varied from 30 minutes to 8 hours.

Premedication consisted of a barbiturate, morphine (4 to 8 mgm.) or meperidine (25 to 75 mgm.), and scopolamine (0.2 to 0.3 mgm.). Fractional doses of sodium seconal (15 to 25 mgm.) or meperidine (10 to 25 mgm.) were occasionally given intravenously during the first half hour of anesthesia. Anesthesia was induced with nitrous-oxide-oxygen on the demand flow, nonrebreathing principle which offers a smoother induction. After induction d-tubocurare or flaxedil is added to produce muscular relaxation. Respirations are assisted when necessary. Intubations were performed in only 3 patients.

Electrocardiograms were taken before surgery and frequently during the anesthesia. Eighty-one per cent of the patients showed no adverse changes during anesthesia, and many of these had major cardiac disease. No anti-arrhythmic drug was used in any patient. There was some evidence of sympathicoadrenal stimulation shown by an occasional sinus tachycardia, extrasystoles, and increased blood pressure.

The incidence of arrhythmias with nitrous oxide-curare is compared to that reported with cyclopropane, chloroform, ethyl chloride, and ether, all of which have a significantly higher incidence of arrhythmias associated with their use. It is suggested that this higher incidence may be due to the specific effect of these agents upon the myocardium or to the deeper level of anesthesia which is produced with these agents. The danger from autonomic system imbalance, surgical reflex stimuli, hypoxia, and hypercapnia is increased proportionately with the depth of anesthesia.

In 8 patients, electroencephalographic studies were made to evaluate the degree of cerebral depression. The brain wave patterns showed practically no change during anesthesia from the control tracings.

It is submitted that light anesthesia causes minimal disturbances of the autonomic compensatory mechanisms and permits a more nearly normal cardiovascular function. —*Rosemary Susat, M.D.*

Anesthetic Problems of Surgical Correction of Aortic Insufficiency. JOHN A. O'DONNELL and THOMAS F. MCDERMOTT. *Anesthesiology*, 1955, 16: 343.

THE ONSET of decompensation in a patient with aortic insufficiency marks the beginning of the terminal end of the disease. Medical measures are not effective. The development of a surgical procedure by Hufnagel, in 1951, offers these patients the best prognosis. The technique consists of inserting a plastic valve in the aorta distal to the origin of the subclavian artery. Since such patients are extremely poor anesthetic and surgical risks, the difficulties and results in 43 anesthesias administered to 42 patients are presented.

The pathologic physiology of aortic regurgitation produces, as it progresses, tremendous enlargement of the left ventricle. The low diastolic pressure contributes to angina and serious defects of electrocardiographic conduction. Mitral stenosis, coarctation of the aorta, aortitis, aneurysm or stenosis, or the coronary orifices are frequently associated conditions.

All patients in this series had developed progressively increasing and medically irreversible congestive heart failure.

The patients were admitted to the hospital one week prior to surgery for a complete workup and evaluation. Vital capacity determinations were usually 50 to 75 per cent of normal. The patients were brought to surgery in the best condition possible.

Premedication consisted of a barbiturate one and a half hours preoperatively, and morphine and scopolamine one hour preoperatively. Demerol was abandoned because of its belladonna-like reactions.

These patients tolerate anesthesia very poorly. Early in the series, the patients were induced with a minimum of pentothal, then placed on a nitrous oxide-ether sequence and intubated. Extremely small amounts of anesthetic cause cardiovascular depression. One patient developed a fatal cardiac arrest as intubation was being attempted with this technique. Since then, intubation has been performed under topical anesthesia. Pentothal is given until consciousness is lost, and the patients are maintained on nitrous oxide and oxygen with small amounts of ether or intravenous morphine.

Since these patients have an average systolic blood pressure of 150 mm. Hg, the authors believe that a systolic blood pressure of over 100 is a critical minimum. There is frequently a serious fall in pressure when the patient is turned from the supine to the lateral position. The vasopressor of choice was dilute neosynephrine drip.

Following occlusion of the aorta, the sytolic blood pressure is elevated an average of 40 to 100 mm. Hg. The radial artery is surgically exposed beforehand in all cases, either for withdrawal of blood, if necessary, during occlusion of the aorta, or for intra-arterial transfusion. A continuous electrocardiographic tracing is taken.

There were 11 deaths in the series of 42 patients anesthetized, 3 of which occurred in the operating room, and 2 in the first 3 postoperative days, in which anesthesia may have been a factor. Four deaths occurred suddenly in the first 10 days postoperatively, and 2 deaths occurred in patients who had been discharged from the hospital, but were readmitted because of complications. The case histories of the patients who died are presented in detail.

—*Rosemary Susat, M.D.*

Paresis of the Phrenic Nerve During Brachial Plexus Block Analgesia, and Its Importance. KARL-GUSTAV DHUNÉR, ERIK MOBERG, and LARS ONNE. *Acta chir. scand.*, 1955, 109: 53.

THE AUTHORS discuss the complications encountered in a series of 956 cases in which brachial plexus block was carried out. In 2 the condition was of major importance: a hemopneumothorax, which resolved with aspiration, and a severe radial and median nerve paresis which did not completely disappear after 5 months. Minor complications include drug reactions, nausea, fainting, and partial pneumothorax. The experiences of others are mentioned.

Phrenic nerve paralysis has been noted by several authors. To study this phenomenon, 204 patients subjected to brachial block were examined fluoroscopically. The maximum incidence of diaphragmatic paresis occurs within 30 minutes after the block has been performed. This may disappear quickly, before paresis of the arm diminishes. Of those patients studied between ½ and 1½ hours after block, diaphragmatic weakness was noted in 27.7 per cent. In those observed after 1½ hours the incidence was 15.6 per cent.

No significant difference was noted when the block was performed on the left or the right, when the patient was in the sitting position or the supine position, or when different physicians performed the block.

Pneumothorax occurred in 4 of the patients. It was minimal and caused no symptoms.

The influence of phrenic nerve paresis on respiration was evaluated by measuring the vital capacity in 11 cases. In those with normal diaphragmatic motion, no change in vital capacity was noted. In those with paresis, an average decrease of 28 per cent was noted; the maximum was 41 per cent. In patients with poor respiratory function (polio, emphysema) this may cause hypoventilation. With normal lung function, the authors do not believe that this temporary decrease in vital capacity is harmful.

—*Victor M. Bernhard, M.D.*

Effect of Controlled Hypotension with Pendiomid (As Used in Surgery) on Renal Hemodynamics and Water and Electrolyte Excretion—a Comparison with Hexamethonium and Arfonad, and the Effect of Norepinephrine on These Responses. JOHN H. MOYER, ROBERT MCCONN, and GEORGE C. MORRIS. *Anesthesiology*, 1955, 16: 355.

THE PURPOSE of this study was to observe the response of renal hemodynamics to hypotension produced by a continuous infusion of pendiomid, and to compare this response to that of a similar group of patients who received hexamethonium or arfonad. Additional observations were made on water excretion, electro-

lyte excretion, and the effect of blood pressure elevation with norepinephrine.

The glomerular filtration rate was measured on 9 normotensive patients. After suitable control studies of sodium and potassium excretion and plasma levels, pendiomid was administered by continuous intravenous infusion of 0.1 to 0.2 per cent in 5 per cent glucose in water. The average amount was 250 mgm. over a three-hour period, during which time the mean blood pressure ranged from 68 to 111. After 2 hours of continuous hypotension with pendiomid, norepinephrine was given by continuous infusion to 6 of the 9 patients, to return the blood pressure to the control levels. The infusion of pendiomid was continued at the same rate as during the period of hypotension in order to maintain the same degree of ganglionic blockade. After the blood pressure was stabilized at the control level with norepinephrine, the glomerular filtration rate, renal blood flow and the excretion rates of water and electrolytes were determined again.

There was not a statistically significant reduction in renal blood flow, although several patients showed a sharp depression in renal blood flow with the initial hypotension. When the renal vasoconstriction occurred, it was probably due to blockade of the sympathetic ganglia to other areas of the body, which was more complete than it was to the renal vessels. However, when a reduction in renal flow occurred, it returned to the control levels within the first 30 minutes after the infusion of pendiomid was started.

The glomerular filtration rate was moderately reduced, though the change was not statistically significant. There was, however, a significant and sustained depression in water excretion; there was a parallel reduction in sodium excretion; potassium excretion was significantly reduced initially but returned to, or exceeded, the control value after one hour.

When the blood pressure was increased to control levels with norepinephrine, with the continued infusion of pendiomid, both the glomerular filtration rate and renal blood flow returned to control values, if they had been decreased. This indicates that the reduction in glomerular filtration during pendiomid infusion is a result of the hypotension rather than being a specific renal vascular effect of pendiomid. After the blood pressure was restored with norepinephrine there was only a slight increase in water excretion, but a greater and significant increase in sodium excretion.

These observations indicate that during the immediate hypotensive period there is a relative renal vasoconstriction in the kidney which rapidly but only partially compensates. There is not enough depression of renal blood flow to produce renal damage from ischemia.

The reduction in glomerular filtration apparently led to sodium and water retention. It is suggested that one should avoid administering large volumes of fluid during surgical procedures employing controlled hypotension, since pulmonary edema may be encountered.

The renal response to pendiomid is similar to that of hexamethonium. Arfonad, however, produced a significant reduction in renal blood flow, probably because of the greater blood pressure reduction following its administration.—*Rosemary Susat, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Translumbar Aortography as a Diagnostic Procedure in Urology; with Notes on Caval Phlebography. N. S. MALUF and CORNELIA B. MCCOY. *Am. J. Roentg.*, 1955, 73: 533.

THE AUTHORS discuss their method of translumbar aortography and their experience in a series of about 250 cases. The medium utilized was either 75 per cent neoiopax or 70 per cent urokon, and they recommend that an intravenous test dose of .25 c.c. of the dye be administered prior to the procedure. It was their experience that local anesthesia was the most appropriate for this study. After placement of the needle in the aorta, approximately 2 c.c. of the dye are injected, and the patient is asked if he has any discomfort. In this way, extravasation can be checked. Twenty to 40 c.c. are injected in three to five seconds and the exposure is made during the injection of the last 5 c.c. Stereoroentgenograms are made by making a second injection, care being taken to withdraw the needle from the aorta between injections. This is done to prevent tearing due to inadvertent movement of the patient. The use of Esmarch tourniquets on all of the limbs showed little improvement other than making the internal iliacs more conspicuous. Other media utilized have included 80 per cent sodium iodide, 75 per cent neoiopax, 70 per cent diodrast, and 70 per cent urokon. It was considered that the 70 per cent urokon was the most satisfactory.

The ages of the patients in this series ranged from 10 to 73, and it was the author's belief that advanced age was not a contraindication to the examination. With respect to caval phlebograms, the authors utilize this method for demonstrating obstruction, and advise injection from the right side since a partial obstruction is caused on the left by the left common iliac artery.

Few complications have been encountered. One patient developed a localized pleuritis and in one the thoracic lymph duct was severed. They felt that the latter accident could have been avoided. In their hands they have found no nephrotoxic effect from the procedure. A transient hypotension lasting several minutes occurs, with gradual return to a normal and hypertensive range. This fluctuation is most marked with neoiopax and less so with urokon. In 4 cases dye was inadvertently injected into the superior mesenteric artery with no harmful effect other than a sensation of warmth.

The authors substantiate the work of Trueta in that stimulation of the sciatic nerve (tibial) brings about marked narrowing of the renal arteries.

One of the important values of aortography is that of differentiating cysts from adenocarcinoma of the kidney. The latter betrays itself by a pooling of the dye. The differential has not been possible between cyst and cystadenoma. Abscess can be differentiated on the basis of a history of fever, local tenderness, and pyuria. In the case of papillary carcinoma aortography is of no aid. Hemorrhage following trauma of the injection may simulate a tumor. In the authors' series adrenal tumors showed no pooling of the dye.

Another important feature of this examination is found in the study of the vessels at the renal pedicle. This may be of great help in determining the surgical approach in cases of tumor, and also in benign conditions such as aberrant arteries and polar arteries. The aortogram is at times combined with a venous urogram, retrograde pyelogram, or a study of the retroperitoneal air.

Of 8 patients with adrenal neoplasm, 4 had partial or complete obstruction of the vena cava, with development of a collateral circulation. The authors believe that caval phlebography should be a preoperative routine in every diagnosed case of adenocarcinoma of the kidney. —*A. Edward O'Hara, M.D.*

The So-Called Prolapse of the Gastric Mucosa Into the Bulbus, an Erroneous Roentgenologic Diagnosis (Der sogenannte Prolaps von Magenschleimhaut in den Bulbus, eine roentgenologische Fehldiagnose). K. POHLANDT. *Fortsch. Roentgenstrahl.*, 1955, 82: 445.

ONE OF THE AUTHOR'S teachers was the Danzig professor, Arnold Bernstein, who died recently in Montreal. Thus, he is familiar with the roentgenologic teachings of the latter with reference to the physiological manner in which the muscular mass of the pylorus protrudes into the bulb in the form of a tumorlike elevation, which he likened to the protrusion of the uterine cervix into the vagina, and for which he coined the term "portio duodenalis ventriculi."

The author himself believes that too little recognition is being given to this phenomenon when approaching the subject of prolapse of the gastric mucosa into the duodenal bulb, and that such a lack of recognition may be leading to too many unnecessary gastric resections. He also believes that part of the confusion with regard to this phenomenon is the result of the habit, especially in the United States and in France, of placing the patient on his back for roentgenography of the duodenal bulb.

In a series of roentgenographic reproductions there are illustrated the diagnostic criteria to be obtained by placing the patient in the first oblique (fencer's) stance. In these illustrations are seen with striking clarity the peculiar arcade, or umbrella-rib effect, which is produced at the summit of this cervix by the mucosal plications or folds of the gastric mucosa which pass from the antrum, through the pylorus, and spread out in all directions toward the annular recess forming the true base or juxtapyloric floor of the bulbus duodeni. This appearance, of course, depends upon the manner in which the bulbus is projected upon the film, the phenomenon varying in appearance in accordance with the angle at which the incident ray strikes the long axis of the bulb.

When the incident ray strikes the long axis of the bulb in a more or less vertical direction, that is, when the summit of the cervix is seen more or less

en face, there is frequently seen a more or less rounded shadow defect of the protrusion of the cervix with its center marked by the shadow of the pyloric aperture, which then radiates outward toward the periphery of the rounded or oval shadow defect in the form of a starlike figure which, again, portrays the lines of contrast material deposited in the depressions between the mucosal plications.

The author believes that with the proper placing of the patient, and the proper degree of pressure, these shadow arcades, astral shadow figures, and the rounded or oval shadow defect of the portio duodenalis ventriculi should be readily recognized and be a marked help in avoiding the confusion so prevalent in the literature dealing with this subject.

Of course, there is no doubt that prolapse of the gastric mucosa through the pylorus occurs; however, the author believes that it is a relatively rare occurrence.

Particularly thought-provoking are the statements of Alnor (*Langenbeck's Arch. u. Deut. Zschr. Chir.*, 1953, 277: 355), who discovered a prolapse in 13.9 per cent of all gastric resection preparations, and stated that a prolapse is frequently uncovered only in the resected specimen, although such diagnosis in the roentgenologic and clinical sense is recently being made preoperatively more and more frequently. The author admits that a prolapse may be frequently produced on the resected specimen by means of the pull of the fingers; however, he thinks that such a phenomenon should rather be designated a "dislocation." He believes that the roentgenologic phenomena of the changing picture of the mucosal shadows present an essentially more reliable delineation of the true condition present than is possible on the resection specimen. He suggests that in future publications the term "mucosal phenomena" be used in place of "prolapse." This last term designates a purely pathological condition which might lead in the diagnosis of these findings to a certain amount of suggestive influence being put into play.

The author does not discuss the recent report of the Swiss roentgenologist (Alnor) of the retrograde prolapse of the duodenal mucosa into the stomach; he merely remarks that the roentgenologic findings were not substantiated at operation.

—John W. Brennan, M.D.

Congenital Duodenal Obstruction; a Clinical, Roentgenological, Surgical, and Follow-Up Study in 29 Cases. SIGURD EEK. *Am. J. Roentg.*, 1955, 73: 713.

THE AUTHOR presents 29 cases of patients suffering from congenital organic duodenal obstruction, 5 of which were intrinsic and 24 of which were extrinsic stenoses.

The author first classified intrinsic duodenal obstruction into: (1) diaphragmatic or veil obstruction; (2) canal stenosis, and (3) atresias. He classifies extrinsic duodenal obstructions as due nearly always to pathologic malrotation of the intestine, with obstruction due to fibrous peritoneal bands from the cecum over the duodenum, but frequently to an accompanying volvulus of the midgut. A rare cause of extrinsic obstruction is annular pancreas. A combination of intrinsic and extrinsic obstruction is very rare.

The chief clinical manifestation is vomiting of bile-stained fluid, sometimes with visible peristalic action in the epigastrium. Uninterrupted vomiting was an expression of permanent duodenal obstruction, either intrinsic or extrinsic. On the other hand, periodic vomiting indicated an intermittent obstruction, due always to malrotation of the intestine with associated volvulus.

The author describes the technique of roentgenologic examination, with supine, decubitus, upright, and inverted views of the abdomen, in an attempt to demonstrate a markedly dilated stomach and duodenum. His second step is a barium enema, administered for both diagnostic and therapeutic needs. A normally placed colon precludes the possibility of malrotation with recurrent volvulus, while an abnormally placed colon may have an associated volvulus relieved by the weight of the enema fluid. His third step in examination is the introduction of 10 c.c. of dilute barium water into the stomach and duodenum for direct examination, with subsequent removal. No complications of obstruction or aspiration were encountered by this procedure in the author's experience.

Twenty-three of the 29 patients were operated upon. There were 3 postoperative deaths. The author believes the choice of operation does not seem to have any importance so long as the obstruction is overcome. Most of the patients were completely symptom-free following surgery. No instances of marginal ulcer were demonstrated in patients who had a gastrojejunostomy, but none of these patients have reached adulthood. Only 2 patients had recurrent volvulus, despite the fact that correction of the malrotation was not routinely done. The author postulates that this is due to postoperative adhesions anchoring the bowel.

Ten excellent diagrams and 11 tables are included.

—Moris Horwitz, M.D.

Roentgen Diagnosis of Small Polyps in the Colon and Rectum. LARS ANDRÉN, STURE FRIEBERG, and SÖLVE WELIN. *Acta radiol.*, Stockh., 1955, 43: 201.

THE AUTHORS discuss the importance of the detection of small polyps, as stressed in the American literature. They then list in considerable detail their method of air contrast examination of the colon, which is as follows: (1) 1 oz. of castor oil is given in the morning of the day before examination, followed by a light diet and an enema the preceding evening and morning of the examination; (2) administration of 15 mgm. of extract of belladonna upon arrival in the department, followed by a second cleansing enema containing tannic acid and dioxiphenylisatin; (3) administration of an opaque enema containing both tannic acid and dioxiphenylisatin, with filming of the colon in multiple projections; (4) a mucosal pattern film is obtained after evacuation; (5) more barium and air are then injected and the excess barium is then removed by means of a rectal tube with the patient in prone position. Multiple oblique and decubitus films are again obtained, using a long focus-film distance and a small focus tube.

Of 1,274 patients examined by this procedure in 1953 and 1954, 159 showed one or more polyps; 46.4 per cent of these were located in the rectum, 21 per cent in the sigmoid, and 13.6 per cent in each of the descending and transverse colons, with 5.4 per cent

in the ascending colon and cecum. Many of the rectal polyps were demonstrated by means of proctoscopy only with great difficulty.

One hundred and thirty-one polyps were between 1 mm. and 5 mm. in size and 60 were between 5 and 10 mm. in size. The authors attribute their success in demonstration of small polyps to careful clearing of the large bowel and to the use of a dense contrast medium, with long distance and fine focus radiography.

Twelve per cent of the 66 polyps removed proved to be carcinoma, and 30 per cent were "precancerous." —*Moris Horwitz, M.D.*

Further Experience with Percutaneous Lienoportal Venography. V. GVOZDANOVIĆ and E. HAUPTMANN. *Acta radiol.*, Stockh., 1955, 43: 177.

THE PRESENT article is an amplification of one presented 18 months ago, the experience of the authors having increased from 14 to 61 examinations.

The technique of splenic puncture through the eighth, ninth, or tenth left intercostal space in the anterior axillary line is described. The authors examined only patients with splenomegaly, and the injection was performed during suspended deep inspiration, using 70 per cent joduron. Twenty milliliters were injected in 3 seconds and films were exposed with a rapid film-changing apparatus. The authors were successful in obtaining adequate roentgenograms in 55 cases. In 6 cases this was not possible, and the causing complication is discussed.

Normal side reactions include a sensation of heat, nausea, and pain in the punctured area. The latter may last from 12 to 24 hours. More major complications include backward leaking of the contrast medium with its distribution between the spleen and surrounding organs, causing pain in the left costal margin and left shoulder. Injection directly into the peritoneal cavity, into the stomach, and into the colon also has occurred, the first causing rather severe pain, the second very severe nausea, and the third no demonstrable symptomatology.

Bleeding from the spleen following puncture is considered a normal feature and in only one case was there severe bleeding which required blood transfusion.

The authors discuss the normal pictures, and point out the great variation in width of the lumen of the splenic and hepatic portal veins, and in their position and course. They believe that the speed of circulation, as demonstrated by serial roentgenography, is of paramount importance in establishing a diagnosis of portal obstruction. The normal time of 4 seconds required to opacify the splenic and portal veins and their ramifications was increased to 6 seconds in such obstruction. No reflux of contrast medium into tributaries of these veins could be found in normal cases, while this was demonstrated in 6 cases of cirrhosis and in 5 of 6 cases of thrombosis of the splenic vein. In addition, in the 6 cases of venous thrombosis and in 1 case of cirrhosis, a collateral circulation through newly formed blood vessels in adhesions was clearly visible.

Differentiation between portal hypertension of intrahepatic and extrahepatic origin depends on actual demonstration of the site of obstruction, or demonstration of failure of the contrast medium to enter the splenic vein in spite of a technically correct procedure.

The procedure also was of value in demonstrating anomalies of the hepatic portal circulation.

The authors believe that the discrepancies in several recent articles have developed largely because of inadequate timing of roentgen exposures in relationship to the speed of the portal circulation. They feel that this is a reliable procedure, that it may be used to correct an erroneous clinical diagnosis of lienoportal thrombosis, to demonstrate the collateral circulation in cases of true thrombosis, as well as to show anomalies of the portal system and to differentiate preoperatively an extrahepatic from an intrahepatic portal obstruction. The article includes 11 excellent reproductions of roentgenray films.

—*Moris Horwitz, M.D.*

A Criticism of Renal Angiography. TOM E. NESBITT. *Am. J. Roentg.*, 1955, 73: 574.

AT THE UNIVERSITY of Michigan, some 200 selected patients with known pathologic conditions have been subjected to renal arteriography in attempts to obtain significant information which would aid in the decisions regarding their treatment. In evaluating these cases in retrospect, there are many clinical limitations to aortography; with very few exceptions, the procedure failed to furnish information which might be helpful in altering the normal course of events.

The differentiation of renal tumor from renal cyst is almost always demonstrated with accuracy by arteriography. Nevertheless it is usually the accepted policy to expose such lesions surgically, and under such circumstances the aortogram becomes a redundant procedure.

By the translumbar route, renal aortography as performed at the University of Michigan has been very disappointing in demonstrating adrenal tumors because there are limitations not only in interpretation but also in technique. Ideally, one would prefer to visualize only the adrenal and renal circulation and avoid filling the other branches of the abdominal aorta. Percutaneous femoral artery catheterization to the renal artery level as described by Goodwin may be a better approach to the problem of adrenal angiography.

Renal angiography has been practically of no benefit in the investigation of patients with renal hypertension. The visual demonstration by roentgenography of the larger vessels of the vascular bed is at best a gross and inaccurate estimate of total blood supply to an organ.

Renal function studies in terms of glomerular rate with creatine and urea clearance tests have proved to be infinitely more valuable in studying patients with hypertension of renal origin.

The arteriogram would seem to be of value for the patient with polycystic disease where surgical intervention for diagnosis is imminent. It would appear also to be of aid in dealing with intrinsic structural anomalies of the renal vessels as encountered in renal fusion, fused ectopia, and aneurysm. The adept surgeon, however, will continue to rely on his skill in dissection at the operating table in dealing with these difficult problems.

In summary, the author believes that only in isolated instances is one justified in utilizing renal angiography, as it is often unnecessary. Eight excellent cases are presented—not to condemn the procedure on the whole but to point out the necessity for a more careful selection of patients for this method of survey, which adds to the expense and subjects the patient to a general anesthetic which is not without risk.

No attempts were made to present the favorable aspects of the procedure because they have previously been elaborated in detail in the literature.

Twenty-three excellent roentgenograms are presented. —*Henry P. Pendergrass, M.D.*

Simultaneous Depiction of the Skeleton and the Surface of the Soft Parts: Combined-Image Roentgen-Photogram (Gleichzeitige Darstellung von Skelett und Weichteiloberflaeche; Kombibild-Roentgenphotogramm). R. BIMLER. *Fortsch. Roentgenstrahl.*, 1955, 82: 529.

THE AUTHOR developed a method for superimposing a photograph of the surface of the soft tissues on the roentgenogram of the corresponding skeletal part. This method is expected to be of value for textbook purposes and for the documentation testimony in medicolegal cases. In particular, it is expected to depict in a striking manner the soft tissue changes accompanying skeletal anomalies.

With this method the usual photographic and roentgenographic apparatus and materials are used. Both exposures are made one right after the other, along the same line of sight. For this purpose the roentgen tube and the photographic camera are mounted on the same adjustable arm of the roentgenographic support, or the photographic apparatus is mounted on a fixture attached to the roentgen tube itself or to the housing of the diaphragm. Since the angle of refraction of the roentgen tube differs from that of the objective lens of the camera, it will, of course, be necessary to adjust the focal distance in each instance to the size of the picture desired.

When the object to be depicted is of considerable thickness it is of advantage to bring the focus of the camera to the same level as that of the roentgen tube. This is done for the purpose of reducing to the minimum the sources of error incident to the projection.

Lead markers are, of course, used to adjust the images to be superimposed on one another. A film of low sensitivity (Agfa-Agepan-film) is used.

In developing the photographic double copy three different methods of finishing the picture are used. These are designated, respectively, methods A, B, and C. Methods A and B have the advantage of simplicity; however, since these methods consist essentially of superimposing the photographic image on that of the roentgen negative, the print cannot be made larger or smaller than the size of the roentgen negative.

With method C the print can be finished to any desired size. For this procedure a double, or twin, negative holder is used.

The photographic negative (24 by 26 mm.) is fitted into one side of the holder and the reduced roentgen negative (9 by 12 cm.) is placed in the other. The photographic negative is adjusted over a sheet of white paper at the distance of the desired enlargement, and the images cast by the lead markers are traced on the white paper; then the reduced roentgen negative is moved over the paper and the distance is adjusted to the point where the marker shadows on the roentgen negative exactly coincide with those of the photographic negative.

The photographic print paper is then placed into the framework and the roentgen negative is printed first. Then the photographic negative is placed over the photographic paper and the photographic image of the soft parts is printed on the same paper.

In a patient with scoliosis it is demonstrated that an apparent corrective tendency (corrective exercises of Gocht) affects only the soft parts without exercising any influence whatever on the skeletal deformity.

—*John W. Brennan, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Blood Volume Studies with the Use of I^{131} Tagged Albumin. LINDON SEED, ERVIN KAPLAN, and KENNETH G. EGGEN. *Am. Surgeon*, 1955, 21: 533.

THE AUTHORS describe their technique of blood volume determinations with the use of radioactive iodinated human serum albumin (IHSA) and point out that the method has advantages over the use of Evans blue T-1824 in that the measurement of radioactivity is more precise than the measurement of color and that it can be repeated at short intervals. The principles of the method involve the intravenous injection of 5 to 20 cubic centimeters of sterile isotonic salt solution containing approximately three microcuries of iodinated human serum albumin. Ten minutes after injection, 3 to 5 cubic centimeters of blood are drawn, and the activity is compared to a standard, with use of a well-type scintillation counter. The authors apparently use 73 cubic centimeters per kilogram as a normal standard of blood volume, and discuss the effect of various factors such as weight loss, physical habitus, sex, and age on blood volume.

The authors found that the venous hematocrit uniformly gives from 6 to 8 per cent higher readings than the actual body hematocrit.

The authors studied 16 cases of congestive heart failure and found that the blood volume was elevated above normal in all of the cases studied. Total packed red cell volume was shown to be elevated more than plasma volume. The values found in these various cases are given.

In a case of acute hemorrhage the blood count, hemoglobin percentage, and hematocrit were all normal, but a blood volume study showed a deficit of 1,600 cubic centimeters. Four days after the bleeding episode, although the blood volume had returned to normal, the red cell mass remained at the previous low point and the hemoglobin, hematocrit, and red cell count were reduced. The authors likewise studied blood volumes in patients with closed injuries, postoperative shock, acute intestinal obstruction, and chronic disability complicated by surgery. The blood volume determinations were apparently of real value in assaying the circulatory status in these patients.

In summary the authors state that blood volume determinations are as valuable as red cell count, hemoglobin determination, and hematocrit, or perhaps more so, and give information that cannot be obtained by any other means.

—*John H. Schneewind, M.D.*

Phlegmasia Cerulea Dolens as a Cause of Gangrene of the Fingers. EDWARD S. MILLS and R. CARLETON BENNETTS. *Canad. M. Ass. J.*, 1955, 72: 917.

THIS ARTICLE is a case presentation of the seventh recorded case of phlegmasia cerulea dolens of the upper extremity. In addition to a case discussion, there is recorded a brief review of the literature, a consideration of the etiology, and clinical manifestations. The case presented is that of a 62 year old male who was admitted to the hospital with cyanosis and massive edema of the left upper extremity, with good arterial pulsations. The right jugular vein was a solid cord and it was postulated that there was a thrombosis of the subclavian and innominate veins. The patient subsequently developed gangrene of several digits. Treatment consisted of anticoagulants, stellate block, and finally amputation of the gangrenous digits. It was conjectured that the anticoagulant might have had a beneficial effect.

The first case was described in 1929. The condition was attributed to thrombosis initiated by intravenous infusion. A second case supposedly resulted from the same cause, while several others were posttraumatic. The etiology is certainly unknown, but it is postulated that there is an abnormal clotting mechanism plus arterial spasm. A similar picture can be reproduced in dogs by compromising all the venous return from an extremity. $Iodine^{131}$ studies made in this case showed some flow through the gangrenous fingers and an increased flow to the affected hand.

Predisposing factors have been mentioned. Clinically the disease is manifested by the sudden onset of pain in the extremity which may be due to arterial spasm. One of the authors believes there are three degrees of the disease: (1) phlegmasia alba dolens; (2) phlegmasia cerulea dolens; and (3) gangrene. Associated with pain and swelling is cyanosis and decrease in skin temperature. The prognosis is better when the disease affects the lower extremities. There is a high incidence of gangrene when the upper extremities are involved.

In the treatment, sympathetic blocks may be used early where an element of arterial spasm is present. Several authors quoted believe that sympathetic block is contraindicated on the basis that it increases the congestion in an extremity whose venous return is already compromised. Rest, elevation of the extremity, anticoagulants, and possibly sympathetic block are recommended by the authors.

—*Richard L. Lawton, M.D.*

Tumor Metastasis (Il problema delle metastasi tumorali). EDOARDO GALLICO and FEDERICO PIZZETTI. *Tumori*, Milano, 1955, 41: 205.

THE AUTHORS analyze 1,000 autopsies performed during the past 22 years at the National Cancer Institute for the study and care of tumors, and report upon the lymphatic and hematic metastasis, the frequency of localization of metastasis in the various organs, and the tendency to lymphatic and hematic diffusion of the various tumors. They arrive at the following conclusions:

1. Metastasis follows the laws of diffusion of the hydrodynamics of the lymphatic and hematic circulations.

2. The host tissues play a secondary role in the implantation of tumor cells. The vascularity of the organ

is the important factor in the development of neoplastic emboli.

3. Neoplastic emboli are made up of small groups of cells rather than voluminous masses.

4. The Virchow rule of lymphatic spread of carcinoma and the hematic spread of sarcoma presents many exceptions.

5. The scheme of metastasis as formulated by Walther explains perfectly the various types of metastasis.

6. For various groups of tumors, especially sarcoma, it must be admitted that transpulmonary passage without the formation of pulmonary metastatic foci is possible. This is attributed to the specific ameboid motility of the cells themselves.

7. For tumors that metastasize to the vertebrae and the pelvis, it is important to evaluate the anastomosis between the vena cava and the vertebral venous plexus.

8. It is probable, by histologic or angiographic studies of resected surgical specimens, that one can indicate a prognosis of metastasis according to the major or minor grade of alteration of the vessel walls, especially the veins. —*Lucian J. Fronduti, M.D.*